THE Journal

OF THE AMERICAN DENTAL ASSOCIATION

JULY

1958

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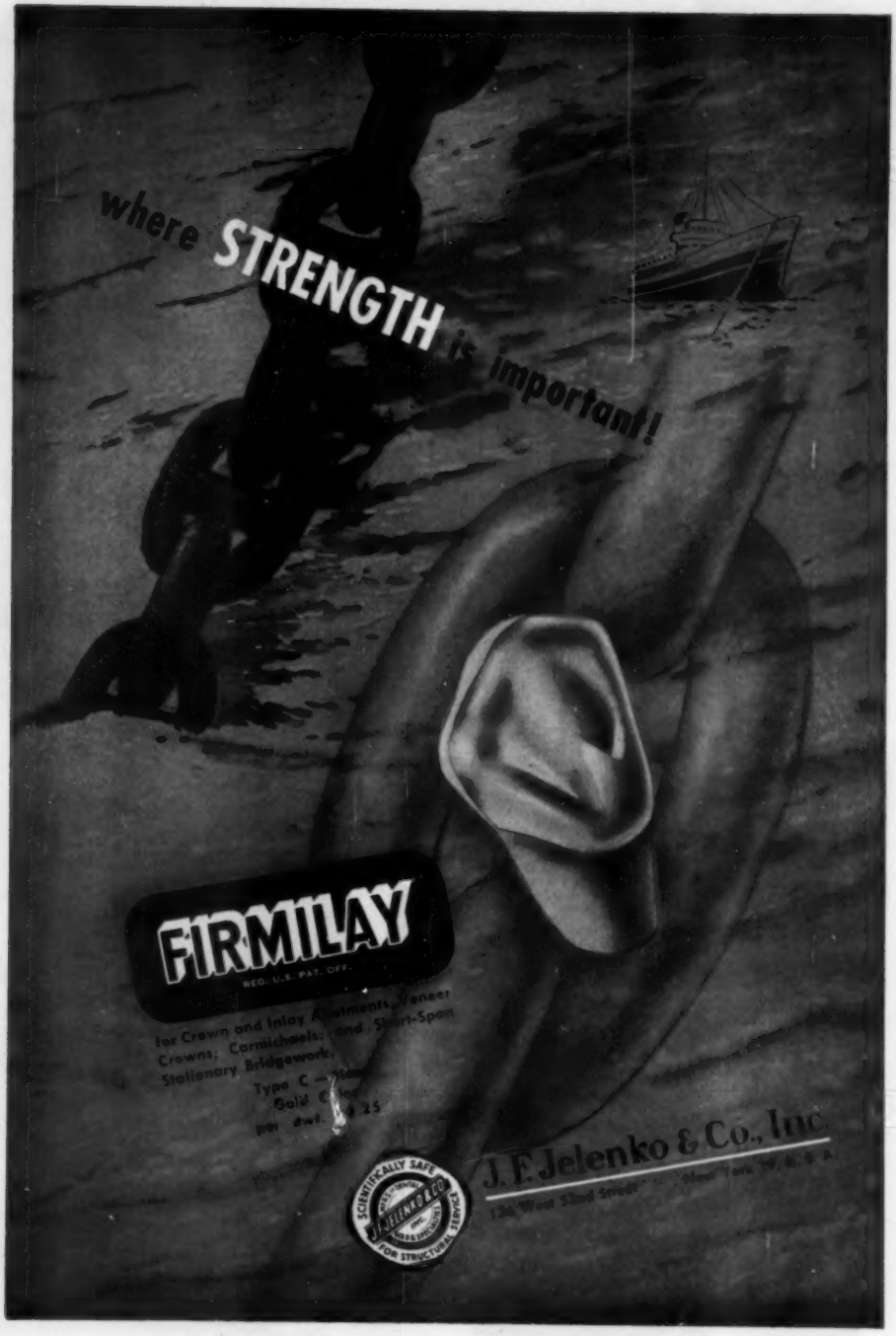
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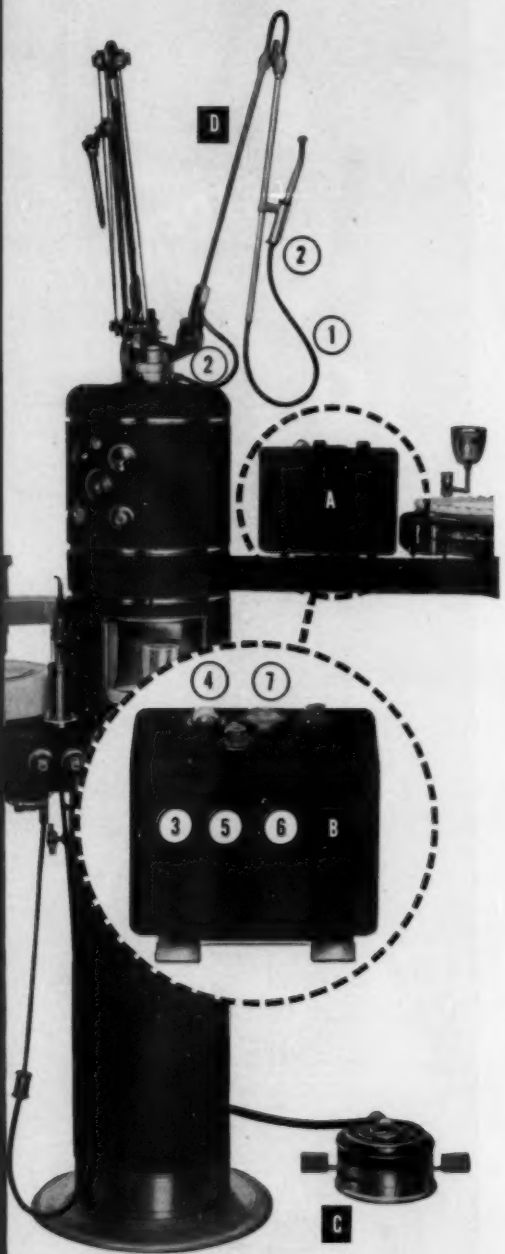

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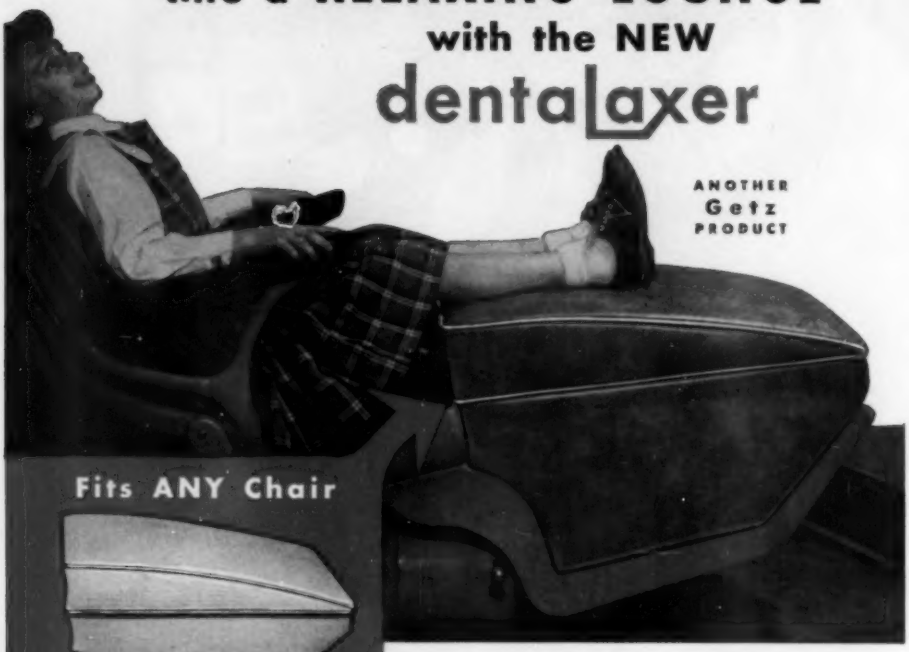

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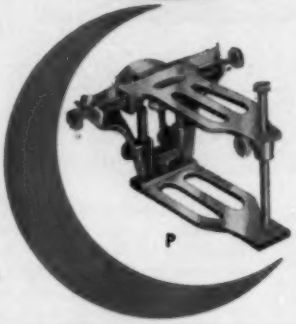

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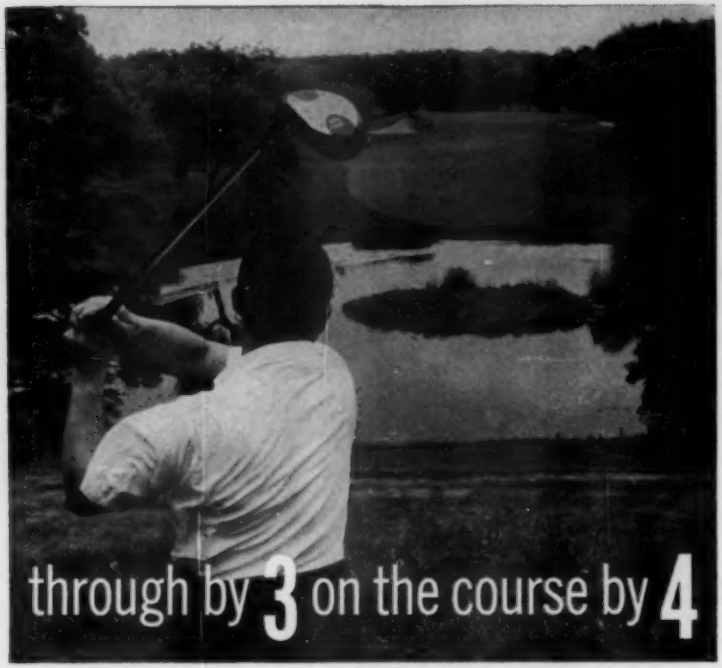

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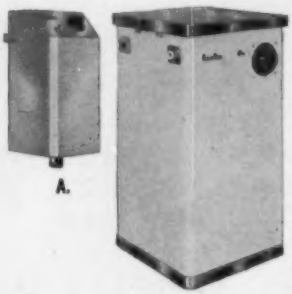

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4.	Crest Park	6.00-12.00	8.00-15.00
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11.	Lynn	5.00- 6.00	6.50- 8.00
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Oaks Manor	U.S. 75 South
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Paramount Courts	U.S. 80 West
Shangri-La Court	U.S. 80 West
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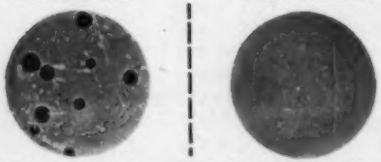

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JULY 1958

THE Journal OF THE AMERICAN DENTAL ASSOCIATION

VOLUME 57 • NUMBER 1

Surgical treatment of benign soft tissue lesions of the oral cavity

Robert B. Shira, D.D.S., Washington, D. C.

Treatment of benign soft tissue lesions of the oral cavity comprises a large segment of the practice of both the general practitioner and the oral surgeon. A wide variety of conditions, ranging from congenital defects to true neoplasms, falls within this category.

The word benign means that the lesions are not malignant, hence are favorable for recovery. Although a benign lesion in itself usually is not destructive to life, it may interfere with function or cause great annoyance to the patient. A large percentage of these lesions occur on the surface of the mucosa or protrude into the oral cavity where they become irritated by the trauma associated with normal oral function. Any lesion subjected to such trauma is potentially dangerous and should receive prompt attention.

Some investigators[1] feel that a benign lesion, subjected to repeated trauma or to other unfavorable environments may, by a process of metaplasia, become a malignant lesion. This contention, although not completely substantiated, emphasizes the necessity for decisive action in dealing with benign lesions of the oral cavity that are subjected to adverse environmental conditions. The treatment of choice is complete surgical removal and this form of therapy is applicable in the majority of instances. By surgical excision the pathologic process is removed and a healthy, protective mucosal covering of the oral cavity is restored.

It is obviously impossible to cover all the benign lesions occurring in the oral cavity in this discussion. Therefore, this paper will be confined to the surgical treatment of certain congenital defects, the hyperkeratotic and the hyperplastic changes of the mucosa, the lesions caused by retention phenomena, and certain of the benign neoplasms.

Presented before the Section on Oral Surgery and Anesthesia, ninety-sixth annual session, American Dental Association, San Francisco, October 18, 1955.

Colonel, Dental Corps, U. S. Army; chief, oral surgery section, dental service, Walter Reed Army Hospital.

1. Thoma, Kurt H. Oral pathology, ed. 6. St. Louis, C. V. Mosby Co., 1954, p. 1441.

Fig. 1 • Congenital double lip consisting of accessory fold of redundant mucosal tissue, left. Center drawing shows method of removing excess tissue by sharp incision. (Courtesy Reed O. Dingman) At right, postoperative view

CONGENITAL DEFECTS

The most common congenital defects of the oral regions are cleft lip and cleft palate. These defects present many problems in which the dentist is interested, but their scope is so great that they have no place in this discussion. Other defects that occur less frequently and which lend themselves well to surgical treatment are congenital double lip and congenital lip pits.

Double lip is a true congenital anomaly[2] and consists of an accessory fold of redundant tissue in the mucosal portion of the lip just inside the vermilion border (Fig. 1, left). It may occur on either lip, but is more noticeable when the upper lip is involved. It is present at birth but does not become noticeable until after eruption of the teeth and is accentuated when the lip is drawn tightly across the teeth in the act of smiling. In some patients the condition is accentuated by sucking the lip or drawing it between the incisors. The deformity causes no functional difficulty but is simply a cosmetic defect and many patients with the condition will suppress their smiles or hold an object over the mouth when smiling or laughing. There is no need to allow this defect to persist for it lends itself well to surgical correction. It is a minor procedure and may be carried out under local or general anesthesia on an outpatient basis. If local anesthesia is used, it should be administered outside the immediate operative field, so that the tissue will not be distorted. After anesthesia is obtained, the lip is drawn taut and the redundant tissue grasped by the points of several hemostats. The excessive mucosal tissue is then excised above the points of the hemostats by means of scissors or scalpel (Fig. 1, center). Hemostasis is obtained, and any exposed mucous glands are dissected free and discarded. The mucosa on either side of the defect is undermined generously and the free margins approximated and closed by interrupted sutures. Considerable postoperative edema generally occurs and usually resolves without complication. Healing is complete in from ten days to two weeks with correction of the cosmetic defect (Fig. 1, right).

Congenital lip pits, also known as paramedian sinuses and lip fistulas, occur on either lip. They are located on the mucosal surface and are recognized as small, circular, slightly depressed areas that are slightly darker than the surrounding tissue. The lower lip is more frequently involved, and the pits are usually located bilaterally, situated on each side of the midline. On the upper lip, they are usually unilateral and are found at the point where the cleft lip ordinarily would occur. The defect consists of an invagination of the mucosa into the underlying connective tissue, varying

2. Dingman, R. O., and Billmen, Howard. Double lip. J. Oral Surg. 5:146 1947.

in depth from 5 to 25 mm. Mucous glands empty into these tracts and mucus may be secreted from their orifices.

If these lesions are small and asymptomatic and cause little or no cosmetic defect, no treatment is indicated. However, larger lesions that are unsightly or annoying to the patient should be removed.

The surgical procedure is simple and may be done with local or general anesthesia. It is best handled by wide, elliptical incisions on both sides of the pits, extending roughly parallel to the vermilion border. The incisions are extended sufficiently deep into the substance of the lip to include the entire lesion, and that portion of the lip between the incisions is dissected free and discarded. Hemostasis is obtained, the subcutaneous tissues closed by interrupted absorbable sutures, and the mucosa approximated and closed by interrupted silk sutures (Fig. 2).

LEUKOPLAKIA AND PACHYDERMA ORALIS

Perhaps the most common of all oral lesions arising from the mucosal surfaces are those characterized by the formation of excessive amounts of keratin, and which for years have been referred to as "leukoplakia." The term, originated in 1877 by Schwimmer,[3] is an all-inclusive one which has been used to denote all "white patches" occurring on the mucous membrane. However, the term leukoplakia, in addition to bringing to mind the clinical picture of a white lesion on the mucosa, carries the implication of a potentially dangerous or perhaps premalignant lesion. Although it is true that some of the "white patches" are potentially dangerous and may go on to malignant transformation, the majority of them are innocuous and represent merely a thickening of the mucosa developed as a protective mechanism against local stimulation or irritation. On a clinical basis the differentiation between the potentially dangerous lesions and the relatively innocuous lesions is difficult or almost impossible since they possess many similar characteristics. Both may appear as white, elevated, thickened, irregularly outlined lesions of varying size. Both may cause changes in the texture and flexibility of the tissue and present fissuring and "cracking" of the involved surfaces. Both may show varying amounts of overproduction of keratin. Furthermore, both may present clinical findings similar to other entirely different groups of lesions, such as lichen planus, psoriasis, and lupus erythematosis. It is important that a differentiation be made, because different therapy is indicated for each lesion. Since clinical differentiation is so difficult, the oral pathologist should be called upon for help. Fortunately he has at his command certain histologic criteria that are generally useful in separating the entities and can be depended upon as an accurate guide for proper therapy. These histologic criteria are called "dyskeratosis," the term used to describe the disturbance in the orderly maturation of stratified squamous epithelium. It is recognized by changes in the size and shape of the cells, abnormal mitoses, nuclear fragmentation, cytoplasmic inclusions, altered staining characteristics, and other abnormalities.[4] When dyskeratosis is present, it places the lesion in the potentially dangerous and possibly premalignant grouping, and when it is absent, the lesion may be considered relatively innocuous.

Bernier[5] has advocated the reservation of the term leukoplakia for that type of hyperkeratotic lesion that presents the histologic finding of dyskeratosis. He has suggested further the term "pachyderma oralis" for the second type of hyperkera-

3. Bernier, J. L. Management of oral disease. St. Louis, C. V. Mosby Co., 1955, p. 424.
4. Bernier, J. L. Management of oral disease. St. Louis, C. V. Mosby Co., 1955, p. 437.
5. Bernier, J. L. Management of oral disease. St. Louis, C. V. Mosby Co., 1955, p. 428.

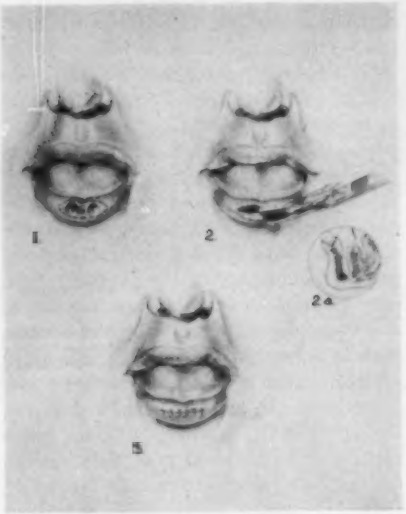

Fig. 2 • Congenital lip pits. (1) Preoperative view; (2) elliptical incisions around the lesion, extending roughly parallel to the vermilion border; (2a) incisions converging beneath inferior portion of the pits, and (3) wound closed by primary sutures

totic lesion, presenting clinical findings similar to leukoplakia but lacking the all important histologic finding of dyskeratosis. In his thinking, leukoplakia, when defined by these criteria, is a potentially dangerous, premalignant lesion and as such should be treated vigorously until completely eradicated. Pachyderma oralis, on the other hand, representing a protective mechanism on the part of the mucosa, does not carry the serious implication of leukoplakia and may be treated in a more conservative manner.

Kollar and others[6] have suggested that the term leukoplakia be discarded because of the many varied interpretations given it by different clinicians and pathologists. They suggest, in its place, a long and detailed classification of the disturbances in maturation of epithelium, based on histologic criteria. Although their classification has merit, it is rather unwieldy and possibly may be more detailed than necessary. The clinician is interested primarily in separating the dangerous from the innocuous. Since the term leukoplakia has been used universally for many years and is an integral part of the vocabulary of most clinicians and pathologists, it seems more logical to retain it as Bernier suggests and in the future limit its use to the potentially dangerous lesions that present the histologic findings of dyskeratosis. By the same token some term is needed to denote the common epithelial changes in which dyskeratosis is absent and Bernier's term "pachyderma oralis" seems to be sufficiently descriptive.

Since the clinician cannot make the distinction between leukoplakia and pachyderma oralis, and since this differentiation is so important because of the urgency for adequate treatment of the potentially dangerous variant, it is suggested that biopsy specimens be obtained from every persistent white lesion of the oral mucosa that cannot otherwise be identified by its own particular clinical characteristics (lichen planus, psoriasis, and so forth) and submitted to the pathologist for histologic examination. Only by following this plan can an accurate diagnosis be made and the best interests of the patient be served.

In the treatment of these lesions the entire region involved should be removed by an excisional type of biopsy whenever feasible. Relatively large portions of oral mucosa may be removed by surgical excision and the defects closed by primary suturing after adequate undermining of the margins. The term "stripping" has been applied to this technic (Fig. 3). Local or general anesthesia may be employed. After securing anesthesia, the section to be removed is outlined by making an incision through the mucosa into the subcutaneous tissue. By starting at

6. Kollar, John A. Jr., and others. Leukoplakia. J.A.D.A. 49:538 Nov. 1954.

one margin, the portion to be removed is elevated by hooks or tissue forceps and the entire segment separated from the underlying tissue by sharp dissection. A distinct line of separation is established easily and the dissection may be carried out with dispatch. After removal of the lesion, the margins of the wound are mobilized by generous undermining and, after hemostasis has been effected, may be approximated and closed primarily by interrupted silk sutures. Sections as wide as 2 to 2.5 cm. and of any length may be treated in this manner (Fig. 4).

When the entire lesion has been removed as described, it may be considered cured when healing takes place. However, known irritative and stimulating factors should be eliminated to obviate the possibility of recurrence, and the patient should be kept under periodic observation.

When larger regions of the mucosa are involved and the complete removal of the entire lesion is not feasible, smaller biopsy specimens should be taken from several spots. After examination of the specimens by the pathologist, a conservative approach may be justified toward the remainder of the lesion if it is reported to be pachyderma oralis. Removal of irritants, administration of large doses of vitamins A and B complex and hormonal therapy may bring about a regression. However, if the pathologist reports the lesion to be leukoplakia, conservative therapy is contraindicated and a vigorous surgical approach to remove the entire lesion should be carried out. Although it may not be feasible to remove the entire region as a single surgical procedure because of its size and difficulty in primary closure, a "stripping" technic, carried out in stages, often will produce the desired results. A generous portion of the involved segment is excised and closed primarily as described previously. After healing, another portion may be excised, and by mobilizing the margins, including the healed previously operated region, primary closure is again possible. This procedure may be repeated until all of the involved region is removed. The looseness of the oral tissues and the ease with which they are mobilized makes the procedure possible.

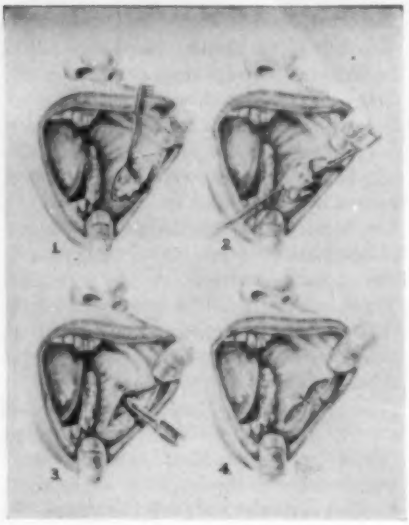

Fig. 3 • "Stripping" and surgical removal of a region of leukoplakia. (1) Incisions outlining tissue to be removed; (2) "stripping" lesion from underlying connective tissue; (3) mobilizing margins of the wound by undermining, and (4) primary closure by interrupted sutures

Although there are few regions in the oral cavity where the stripping procedures are not applicable, some surgeons prefer to resort to electrosurgery for eradication of the lesions of leukoplakia. Desiccation and coagulation are the procedures utilized. Desiccation is the dehydration of the tissues and is carried out by a light, uniterminal current applied by means of an electrode and spraying a light spark over the involved surface. The desiccated tissue is scraped off and the base re-treated. This is repeated until the entire region is destroyed and healing is allowed to take place by granulation. Coagulation is a process whereby the

tissue cells are actually boiled in their own fluids. It is accomplished by a hotter and stronger current than desiccation and either a ball or disk coagulator is used. The coagulated tissue is scraped away with curets and the base re-treated until the lesion is destroyed.[7] Healing progresses by granulation.

A lesion once diagnosed as pachyderma oralis may progress into leukoplakia if the causative factors are not corrected. These lesions should be kept under observation, and if they do not respond to conservative therapy within a reasonable time, they should be subjected to repeated biopsies. If leukoplakia is found at any time, the conservative therapy should be discontinued and the entire lesion removed by surgery, desiccation, or coagulation. There is no place for frailty or indecision in the proper treatment of this condition.

LOCALIZED HYPERPLASIAS

Other commonly encountered benign lesions are the localized hyperplasias occurring on the gingiva or oral mucosa. They are not true neoplasms but represent tissue reactions to a continued irritation. Although repeated injury from the sharp edges of a carious tooth, overhanging fillings, subgingival calculus, or bony spicules may be the causative factor, the most common cause is the ill-fitting denture. They may occur in any part of the oral cavity but are always located at the site of the irritation.

Thoma[8] recognizes two types of hyperplasia and applies the terms "epulis granulomatosa" and "epulis fibromatosa." The epulis granulomatosa usually forms at the site of an extraction wound and consists of a proliferation of granulation tissue resulting from irritation of a bony spicule. If the lesion is allowed to persist, it will become epithelized in time and form a pedunculated growth. These lesions should be recognized early and completely removed by surgical excision. The socket or site from which they are growing should be thoroughly investigated for a bony spicule or other foreign body that caused the proliferation. If the stimulating factor is removed along with the soft tissue mass, there is little chance of recurrence.

The epulis fibromatosa consists of a proliferation of fibrous tissue resulting from a chronic irritation. Those located on the gingiva are usually small and are the result of irritation from sharp carious teeth, overhanging fillings, or subgingival calculus. They should be removed by excision after the causative factor has been corrected.

The prolonged wearing of ill-fitting

7. Ward, Grant E., and Hendrick, James W. Tumors of the head and neck. Baltimore, Williams & Wilkins Co., 1950, p. 17.

8. Thoma, Kurt H. Oral pathology, ed. 4. St. Louis, C. V. Mosby Co., 1954, p. 1359.

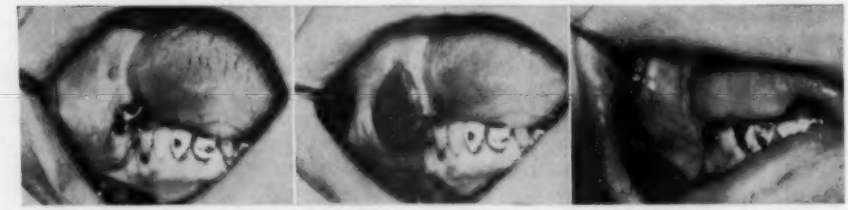

Fig. 4 • Left: Area of leukoplakia involving mucosa of alveolar ridge and cheek. Center: Lesion removed by "stripping" procedure. Margins of the wound undermined and closed primarily. Right: Two years postoperatively. There has been no recurrence of the lesion

dentures creates a condition that is inviting to the formation of soft tissue hyperplasias. As the osseous structures resorb, the dentures lose their support and become an irritating factor. The irritation produces hyperplastic reactions that result in the development of large tissue folds and redundancies about the cheeks, gingiva, and vestibule. As a rule the changes are so gradual that the patient is unaware of their presence. They may be seen in association with any type of prosthesis, but the ill-fitting maxillary denture —particularly if it is flangeless—associated with a few remaining mandibular anterior teeth, produces the most startling lesions.

These regions of hyperplasia resulting from denture irritation are potentially dangerous and should be excised completely. Although the majority of them are benign, an occasional malignancy is encountered. Archer[9] reported a squamous cell carcinoma which developed in a region of hyperplasia as a result of an ill-fitting denture. Hobaek,[10] reporting on 560 patients with oral malignancy, found 204 wearing dentures and in 86 instances he felt the irritation from the denture to be a direct contributing factor to the malignancy.

The correct management of these lesions presents one of the most difficult problems in the field of oral surgery. The irritating denture should not be worn for a period of two or three weeks prior to surgery in order to allow any inflammatory reaction, which is usually present, to subside. In correcting these abnormalities, removal of the excess tissue by sharp dissection, followed by adequate tissue support, is the treatment of choice.[11] The goal to be attained is the removal of the mass, with maintenance of a good labial and buccal vestibule. An incision is made at one margin of the involved region and a soft tissue flap of full-thickness mucosa is developed. This is separated from the underlying hyperplastic fibrous tissue by sharp dissection. The excessive fibrous tissue then is dissected out and discarded. If the mass is over the alveolar process the fibrous tissue is excised down to the bone; if it is in the labial or buccal soft tissue, it is excised until normal tissue is reached. The mucosal flap is returned to position, any excess is trimmed away, and the wound is closed by interrupted sutures.

If the hyperplastic tissue is small and pedunculated, an alternate procedure may be utilized. The base of the mass may be grasped by Allis forceps, pulled taut and cut free along the edge of the forceps. The margins of the wound are undermined and approximated with interrupted sutures.

To promote prompt and uneventful healing, and to maintain the mucosal flap in intimate contact with the submucosal tissues, some type of mechanical support should be used. The patient's denture usually can be utilized as a splint by correcting its adaptation with modeling compound. Periodontal surgical dressings added to this denture and inserted immediately after surgery will fill in the discrepancies and afford excellent tissue support. If no denture is available, an acrylic splint may be constructed prior to surgery, or if this is impractical, modeling compound may be adapted to the treated region to afford the needed support. These supports must remain in place for sufficient time to allow primary attachment to take place.

Some surgeons advocate the use of the electrocautery in treatment of these hyperplasias. Although this form of treatment has its place, it should be used with caution on those lesions occurring on the labial and buccal surfaces, since considerable scarring usually attends its use.[11] However, in removal of the hyperplasias of the palate, the cautery has a definite

9. Archer, W. Harry. Manual of oral surgery. Philadelphia, W. B. Saunders Co., 1952, p. 304.

10. Hobaek, Andreas. Intraoral mucous- and salivary gland mixed tumors. Acta Radiol. 32:229 1949.

11. Goodsell, J. O. Surgical aids to intraoral prosthesis. J. Oral Surg. 13:8 Jan. 1955.

place. These lesions, often referred to as multiple papillomas, consist of many tiny proliferations of epithelium that present a roughened, inflamed, cauliflower-like appearance. The wire loop cautery, using a cutting current, is the most efficacious method of removing this excess tissue. Only the superficial structures, down to the base of the proliferations, are removed. Little hemorrhage is encountered and healing by granulation is rapid. Removal of these lesions by sharp dissection is extremely difficult and the application of the cautery has produced excellent results.

After removal of the hyperplastic tissue, the patient should not be allowed to wear the old denture. As mentioned earlier, it may be utilized in connection with a surgical pack to afford tissue support during healing, but then should be discarded and a new, properly fitting denture provided.

RETENTION CYSTS

Mucocele • The mucosa of the oral cavity contains many small mucous glands which are subject to retention phenomena caused by obstruction of their excretory ducts. These create within their substance cysts known as "mucoceles" or "retention cysts." They are frequently found on the lips, cheek, and ventral surface of the tongue, but rarely on the dorsal surface of the tongue or palate. They are round, painless, soft tissue swellings which are soft and fluctuant because of the retained secretions of the gland. As they enlarge and come nearer the surface they present a bluish white, "frog-belly" appearance. Because they protrude into the oral cavity and become traumatized, they are a source of great annoyance to the patient and should be removed. Often they are treated inadequately by incision and drainage which results in an immediate collapse of the cyst and relief of the symptoms, but offers no permanent relief since the cyst reforms when the incision heals.

Surgical treatment of the mucocele consists of partial or complete excision. The partial excision consists of a marsupialization procedure in which the external or superficial surface of the cyst is removed and the remaining or deep portion is sutured to the surrounding mucosa. Because this remaining portion of the cyst is lined with epithelium, it soon becomes continuous with the oral epithelium and thus eliminates the cyst. This type of treatment produces good results but allows occasional recurrences and should be reserved for the very large retention cysts. Since most mucoceles are small, complete surgical removal is the treatment of choice and can be accomplished without resulting deformity. Removal is a minor procedure and usually is done as an outpatient procedure. Wide elliptical incisions are made on both sides of the cyst and extended down to the underlying muscle. This depth of incision is important in order to allow the removal of the involved gland along with the cyst. After the incisions have been made, an Allis forceps is attached to the portion which is to be removed, and after tension is applied the dissection is continued along the depth of the incisions until the entire mass is freed. Hemostasis is obtained, the deep structures closed by interrupted absorbable sutures, and the margins of the wound approximated by interrupted silk sutures. Healing is uneventful and usually occurs by primary intention. Complete surgical removal eliminates the entire cyst and associated glands and prevents recurrences.

Brief mention should be made of the occasional occurrence of mucous retention cysts on the dorsal surface of the tongue. Mucous glands usually are not located in this area, but occasionally an aberrant gland is present which may develop into a retention cyst. As a result of trauma, the cyst may rupture spontaneously and regress, only to recur. A cyst

should be suspected when a painless, fluctuant, localized swelling appears, from which fluid may be obtained by aspiration. After diagnosis these cysts should be removed by marsupialization or complete surgical excision as described earlier.

Ranula • Another type of retention cyst occasionally encountered is the "ranula." It is caused by the retention phenomena in one of the major salivary glands, usually the sublingual, but on rare occasion the submaxillary duct may be involved. It is found in the floor of the mouth, usually at one side of the midline, but when large it may involve both sides. The original lesion is a painless swelling, and as it increases in size it becomes very thin and distended and presents a typical, bluish white color. This is due to the accumulation of a mucoid type of fluid in the cyst. Often the lesion becomes large enough to interfere with function, deglutition and speech.

Like the mucocele, the ranula should be surgically excised. Unlike the mucocele, it does not lend itself well to complete surgical excision. Usually the cyst is quite large and its walls are extremely thin. Because of this, attempts to enucleate the cyst without rupturing the walls usually result in failure, and once the walls have ruptured they are extremely difficult to identify for complete removal. Wide surgical excision, as recommended for the mucocele, is impractical because of the size, location, and proximity to other vital structures. Hence a marsupialization or partial excision of the cyst is the method of choice, and if done correctly will insure excellent results.

The procedure may be carried out with local or general anesthesia. After anesthesia is obtained, that portion of the mucosa at the floor of the mouth over the cyst is grasped by an Allis forceps. Tension is applied and by means of scissors or a scalpel, a generous portion of mucosa and the underlying superficial

Fig. 5 • Marsupialization of a ranula of the floor of the mouth. Oral mucosa over lesion and superficial portions of cyst wall have been excised and remaining cyst wall sutured to the surrounding mucosa

portion of the cyst are excised around the perimeter of the lesion. The remaining cyst wall is left undisturbed and is sutured about the incised margins to the mucosa of the floor of the mouth. Thus the epithelium of the mouth and the epithelium lining the cyst wall become continuous (Fig. 5). Healing is rapid and the defect caused by the operative procedure is soon obliterated.

When the cyst is entered in order to cut away its superior portion, the contained fluid is released and the cyst collapses. As previously mentioned, the cyst wall and overlying mucosa are extremely thin and are sometimes difficult to identify after this collapse, which naturally adds to the difficulty of the marsupialization procedure. An alternate procedure that has been used for years and has recently been described by Archer[12] is designed to prevent the collapse of the cyst. In this procedure a small incision is made through the mucosa and cyst wall. The contained fluid is evacuated by suction and the cystic space completely filled with ¼ inch gauze. This packing keeps the cyst expanded while the mu-

12. Archer, W. Harry. Manual of oral surgery. Philadelphia, W. B. Saunders Co., 1952, p. 272.

cosa and superficial layer of cyst wall are cut around the perimeter. The gauze then is removed and the margin of the remaining cyst wall is sutured to the mucosa of the floor of the mouth as described earlier.

BENIGN SOFT TISSUE NEOPLASMS

Any of the soft tissues entering into the formation of the oral cavity may undergo neoplasia, thus making a great variety of tumors possible. If the epithelium alone undergoes neoplasia, a papilloma is formed, whereas neoplastic activity of connective tissue brings about the formation of fibromas, lipomas, and so forth. Other structures, such as nerves and blood vessels, may contribute to the occurrence of neoplasms within the oral cavity. Since it obviously is impossible to cover the entire field of neoplasia in this discussion, this paper will be limited to the more common and more important benign tumors which occur in the oral cavity.

Papilloma • Papillomas are tumors produced by proliferation of squamous epithelium. Two varieties are recognized —the hard and the soft—but they are essentially the same type of tumor and differ only in the amount of keratinization present. The hard papilloma develops large amounts of keratin and becomes hornified, whereas the soft papilloma is flabby and pliable and adapts itself to its environment (Fig. 6). Papillomas vary greatly in size and may be located anywhere on the oral mucosa. They usually are attached by a pedunculated base, but, on occasion, may have a sessile attachment. As they proliferate they develop folds, each of which thickens into a lobe producing a cauliflower-like mass. Since the tumors protrude from the surface and are made up of proliferating epithelium, they are potentially dangerous and should not be subjected to the daily traumatic influence of the oral cavity. Thoma[13] states that it is probably a good policy to consider all papillomas as potential malignancies.

These tumors should be removed with an adequate base of normal tissue. Since the majority of them are pedunculated they are easily excised by elliptical incisions about the base, and the wound may be closed by primary suture. Those with a sessile base should also be excised with a margin of normal tissue and, if possible, the operative wound should be closed by primary suture. If the defect is too large to permit primary closure, it should be allowed to heal by granulation. All tissue should be examined carefully for any evidence of malignant change.

Fig. 6 • Papilloma of mucosa of the hard palate

Fibroma and Lipoma • Fibromas and lipomas are the result of neoplastic activity of the connective tissue and occur frequently in the oral cavity. They are well defined tumors usually projecting out into the oral cavity and are attached by a pedunculated or sessile base. The epithelium over the tumor usually is smooth and is the same color as the surrounding mucosa. They vary greatly in size and usually display a slow rate of growth. They cause no discomfort, but

13. Thoma, Kurt H. Oral pathology, ed. 4. St. Louis, C. V. Mosby Co., 1954, p. 1445.

because they protrude into the oral cavity they are often traumatized and on rare occasion they may become large enough to interfere with function.

Like all lesions that project into the oral cavity, the fibroma and lipoma should be excised surgically. Their removal is not difficult and should be done by elliptical incisions about the base and extending well down into the subcutaneous tissue. Whenever possible the operative defect should be closed by primary suture after adequate mobilization of the margins.

Although most of these tumors grow out into the mouth, occasionally they grow down into the underlying tissue. Diagnosis of these tumors is more difficult and often cannot be established definitely until surgical exploration is carried out. They should be suspected when a region becomes enlarged and a firm, noncompressible, mobile mass, which yields no fluid on aspiration, is palpable. Removal of these tumors is usually an uncomplicated procedure. The tumor is exposed by an incision through the mucous membrane over the mass. The margins of the wound are retracted and the tumor exposed by blunt dissection. A definite capsule surrounding the tumor usually is encountered which forms a line of demarcation and facilitates removal (Fig. 7). The mass is separated from the surrounding tissue by blunt dissection, care being taken to locate any vessels entering the tumor. If vessels are located they are cut and ligated. After removal, the operative wound is closed by collapsing the deeper structures with interrupted absorbable sutures, and the margins of the mucosa are approximated by interrupted silk sutures. The insertion of a drain usually is not indicated.

An interesting variant of the fibroma is a condition known as fibromatosa gingiva. This is a true neoplastic development consisting of an overgrowth of the gingival fibrous tissue. It is more commonly seen in the maxillary tuberosity region but may involve the entire gingiva of the maxilla and mandible. It presents a painless, hard, noncompressible mass of tissue, covered by smooth, noninflamed epithelium in close proximity to the teeth and extending into both the vestibular and alveololingual sulci for varying distances. Occasionally the tumor growth becomes so exuberant that it covers the crowns of the teeth (Fig. 8). When this condition exists, or the tumor formation is so large that it interferes with function, it should be excised surgically. Because of the diffuse involvement, complete excision of the fibrous tissue is impractical and a sculpturing procedure is indicated.

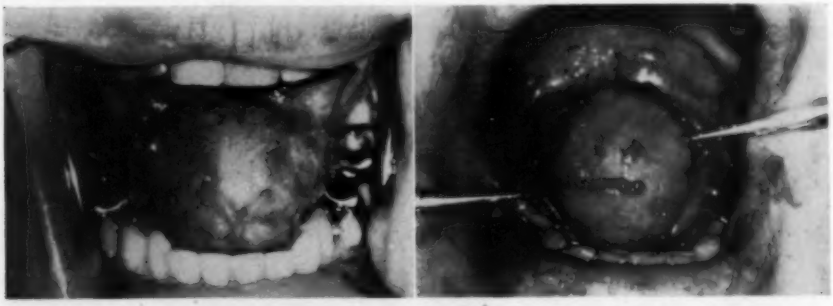

Fig. 7 • Left: Connective tissue tumor (lipoma) developing in floor of the mouth. Right: Removal of lipoma. After reflecting the mucosa, a definite fibrous capsule was found surrounding the tumor which facilitated removal

Excision should be submucosal, so that an epithelial flap remains to cover the operated area. A vertical incision starting approximately 0.5 cm. from the necks of the teeth is made through the mass down to the underlying bone. The section of tissue outlined is dissected free and discarded. Then, by means of a submucosal incision, the remaining excess fibrous tissue is dissected free and discarded (Fig. 9). The mucosal flap formed by this submucosal removal of fibrous tissue is turned over the defect and sutured with interrupted silk sutures. This adequately removes the excess fibrous tissue and provides an epithelial covering that insures rapid and complete healing.

Hemangiomas • Hemangiomas are benign tumors made up of newly formed blood vessels. They are usually congenital in origin and may involve any organ or tissue of the body. The majority, however, occur about the head and neck.[14] Many are small and asymptomatic, but others become extremely large and interfere with function, and some produce considerable deformity. They are important because of the potential danger of serious and possibly fatal hemorrhage that may occur from improper management of the lesion. Since many hemangiomas occur in the oral cavity, their characteristics and diagnostic criteria should be known to every dentist in order to enable him to evaluate the conditions properly and avoid embarrassing complications.

Many classifications of hemangiomas have been suggested, but basically there are two types, the capillary and the cavernous. The capillary hemangiomas are important because they present cosmetic defects. They involve only the most superficial structures and are composed of thin, dilated capillaries lined with either an adult or an embryonic type of endothelium. Although this type of hemangioma occasionally occurs in the oral cavity, it offers no problems because of its superficial nature. It seldom needs treatment and when involved in a surgical field does not add appreciably to the amount of hemorrhage. An extraction may be done safely when the surrounding mucosa is involved by a capillary hemangioma provided there is no concomitant cavernous hemangioma involving either the soft or osseous tissues.

The cavernous hemangiomas are the variety that may cause difficulties. They are soft, compressible tumors consisting of large, thin-walled sinuses with a

14. Figi, Frederick A. Treatment of hemangiomas of head and neck. Plast. & Reconstr. Surg. 3:1 Jan. 1948.

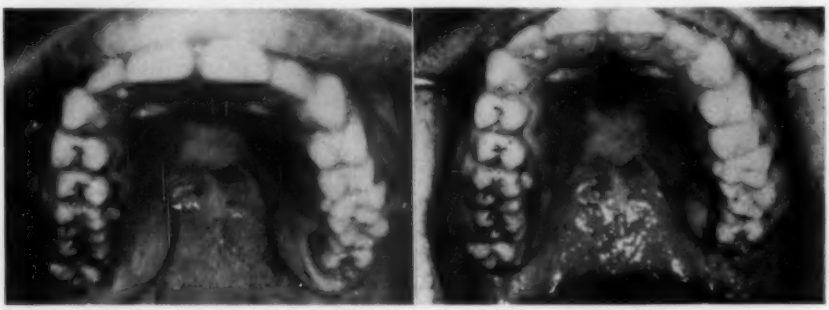

Fig. 8 • Left: Fibromatosa gingiva of the maxilla. Note soft tissue extending over the lingual portions of the crowns of the molars. Right: Postoperative view after removal of excessive fibrous tissue

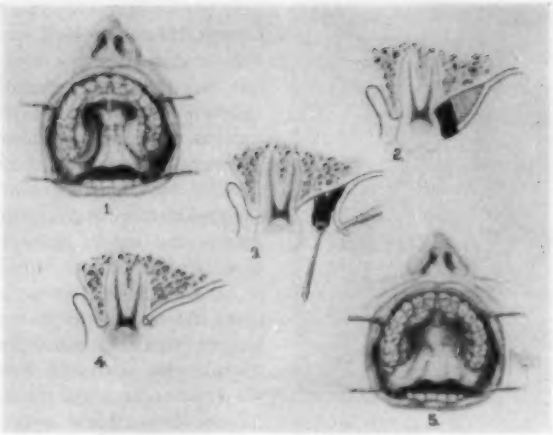

Fig. 9 • Sculpturing procedure for removal of excessive tissue in fibromatosa gingiva. (1) Outline of incision; (2, 3) black and shaded areas indicate discarded tissue, and (4, 5) mucosal flap sutured over defect

limited quantity of intervening connective tissue stroma. They frequently occur in the oral cavity and although some may be small and asymptomatic, others may produce considerable enlargement and may interfere seriously with function. These tumors may involve either the soft tissue or osseous structures and on occasion the same tumor may involve both the soft and hard structures. Severe hemorrhage after even minor trauma is an ever present possibility.

Those involving the soft tissues are usually not difficult to diagnose. When superficially located, the characteristic bluish purple color, the irregular outline, and the ability to compress blood from the tumor are pathognomonic for the condition (Fig. 10). More deeply seated lesions offer greater problems in diagnosis, as the overlying tissues hide the tumor. Engorgement of the region after placing the head in a dependent position, and ability to force the blood out of the mass by compression only to have it rush back when the pressure is released, are signs of vascular tumors. Occasionally a bruit can be heard on auscultation and a distinct thrill may be felt on palpation. Aspiration of blood with a large gauze needle from the center of the mass establishes it as a vascular lesion.

Hemangiomas involving the osseous structures of the face are dangerous lesions and several instances of fatal hemorrhage after extraction of teeth have been reported.[15,16] It is important to diagnose the lesions prior to surgery, for even the simple removal of a tooth may be followed by a profuse hemorrhage that may be impossible to arrest. The diagnostic criteria of the intra-osseous hemangioma are vague, but the majority of the tumors that produce symptoms cause a loosening of the teeth in the involved region. The teeth are slightly displaced in a vertical direction but may easily be forced back into proper position by slight pressure. The mobility may result in

15. Broderick, R. A., and Round, Harold. Cavernous angioma of maxilla; fatal hemorrhage after tooth extraction. Lancet 2:13 July 1, 1933.

16. Kroh, F. Tooth extraction and spontaneous hemorrhage. Arch. f. klin. Chir. 137:389, 1925.

Fig. 10 • Cavernous hemangioma of cheek. Lesion was bluish purple in color, irregular in outline, compressible, and became engorged with blood when head was placed in dependent position

spontaneous hemorrhages into the oral cavity. These occur most frequently at night, and usually stop without treatment. The roentgenograms show an ill-defined osteolytic lesion with extremely irregular outlines with a "fading out" into the normal bone. A fine, fibrillar network usually is spread through the lesion. In comparing the roentgenogram of the involved bone with its counterpart on the other side, the involved side generally is found to be larger because of its increased blood supply. These central hemangiomas should be suspected when there is a history of spontaneous bleeding into the oral cavity with mobility of the teeth and the presence of the aforementioned roentgenographic findings.

Treatment of the soft tissue hemangiomas depends on the findings in each particular instance. Small asymptomatic lesions need no treatment. Small symptomatic lesions may be excised with little danger, but large, diffuse hemangiomas present many formidable problems. Complete surgical excision of these lesions may be complicated by profuse hemorrhage and may result in severe mutilation that would leave objectionable cosmetic defects. Hence, surgical excision is contraindicated in many of these large tumors, but they may be satisfactorily treated by radiation or by the injection of one of the various sclerosing solutions.

Surgical excision of the smaller lesions may be done by sharp dissection or with the endothermy knife. Wide elliptical incisions are made through the normal tissue surrounding the tumor. The tumor is elevated with forceps and separated from the normal tissue beneath by continuing the dissection. This procedure must be done carefully in order to locate the vessels entering the tumor. These vessels are then cut and ligated and removal of the tumor completed. The deeper structures are closed by interrupted absorbable sutures and the epithelium approximated and closed by primary suture.

Treatment of the larger lesions by radiation or sclerosing solutions has a common objective. This objective is to produce a fibrosis in the substance of the tumor, which, as it contracts, will eradicate or diminish the size of the blood-filled sinuses. Radiation is indicated particularly when dealing with large tumors in infants and children.[14] Either external radiation, interstitial radium, or radon seeds may be employed, but the therapy must be administered by one with experience in this particular field in order to prevent complications.

Excessive radiation will cause harmful soft tissue changes and arrest bone and tooth development; consequently the therapist endeavors to apply sufficient radiation to bring about a fibrosis of the tumor without causing a deleterious effect on these structures. Screening appliances to protect the teeth and bone may be utilized when interstitial radium is used, but these usually are not applicable when external radiation is employed. However, sufficient external radiation usually can be applied to control the tumor without causing serious injury to the associated structures. It should be

delivered in small doses over a long period of time. Excellent results have been obtained by radiation when applied judiciously by a well qualified therapist.

Sclerosing solutions also may be used to produce the desired fibrosis in cavernous hemangiomas. Many solutions are available, such as 5 per cent sodium morrhuate, sodium oxylate, and sodium psylliate. These solutions are most effective when peripheral constriction can be maintained on the tumor to prevent the rapid dissemination of the solution. Because of the difficulty in obtaining and maintaining peripheral constriction of the hemangiomas in the oral cavity, however, these solutions are often ineffective. For this reason boiling water is probably the sclerosing solution of choice in treating the oral hemangiomas, as it produces a rapid inflammatory response in the lesions and is not disseminated rapidly. Its use was described by Wyeth[17] and it has been used effectively by others.[14, 17, 18]

When boiling water is to be employed, a general anesthesia should be administered because of the intense pain stimuli produced. Provisions should be made to keep the water boiling until injected and the syringe should be preheated to prevent a rapid cooling of the water. When the field is prepared, the boiling water is drawn into a 10 or 20 cc. Luer Lok syringe which has been padded to prevent burning of the operator's hands. The boiling water is injected directly into the tumor with a 22 gauge needle, depositing the solution in various portions of the tumor. Approximately 5 cc. is deposited in each locality and the total amount injected depends on the size of the lesion. Little hemorrhage attends the procedure, but the patient must have close postoperative supervision, as an intense inflammatory reaction usually sets in within a few hours and the accompanying edema and cellulitis may cause respiratory embarrassment. As the inflammatory response subsides, fibrosis sets in with gradual constriction and obliteration of the blood-filled sinuses. An example of this result is shown in Figure 11.

Complete fibrosis is not always obtained with one application of the sclerosing material. The boiling water, on being injected into the tumor, is diluted and cooled immediately by the contained blood and may not produce the desired amount of fibrosis. When this occurs, reinjection, after an interval of three months, is indicated.

Cavernous hemangiomas of the oral cavity also may be treated effectively by electrocoagulation. A sharply pointed, insulated electrode is inserted directly through the mucosa into the mass in several areas and coagulation is accomplished. Quite intensive coagulation is required, because the heat is diffused rapidly by the blood and by carbon forming on the electrode.[14] The intensity of the current must be checked carefully, for excessive coagulation will result in formation of a slough.

Intra-osseous hemangiomas are much more difficult to treat. If they are asymptomatic no treatment is indicated. The symptomatic lesion, however, must receive attention and may be treated by surgical excision or radiation therapy. Surgical excision entails the resection of the involved bone and carries considerable operative risk as well as leaving an objectionable deformity. Radiation therapy is an efficacious method of controlling the intra-osseous lesions without causing extensive deformity. It must be delivered in small doses over a long period of time and only enough administered to bring about the desired fibrosis (Fig. 12). This amount is well below the dosage required to produce an osteoradionecrosis, but is often sufficient to retard tooth and bone development. This

17. Reder, Francis. Hemangioma and lymphangioma, their response to injection of boiling water. Med. Rec. 98:519 Sept. 25, 1920.

18. Kazanjian, Varaztad H., and Roopenian, A. Clinical experience in treatment of hemangiomata. Plast. & Reconstr. Surg. 13:325 May 1954.

is a risk that must be accepted, for control of the tumor is imperative.

PATHOLOGICAL EXAMINATION OF TISSUE

All material removed by surgical excision should be submitted to a pathologist for examination. This procedure not only establishes a definite diagnosis, but more important, tells the clinician whether he is dealing with a benign or a malignant lesion. Whereas diagnosis of many of the oral lesions may be established by observation of their clinical characteristics, the experienced clinician is often reluctant to base his diagnosis on clinical observations alone and usually defers judgment until pathological examination has been obtained. The importance of early detection of malignant change within a tissue is well known and discovery of these early changes is possible only by microscopic examination. Pathological evaluation also furnishes valuable information as to the adequacy of the surgical procedure and can be depended on as an accurate guide to proper therapy. An old saying often quoted states, "Any tissue worthy of removal is worthy of pathological examination."

Fig. 11 • Cavernous hemangioma of cheek shown in Figure 10 after treatment by injection of boiling water. Extensive fibrosis was produced which obliterated the lesion

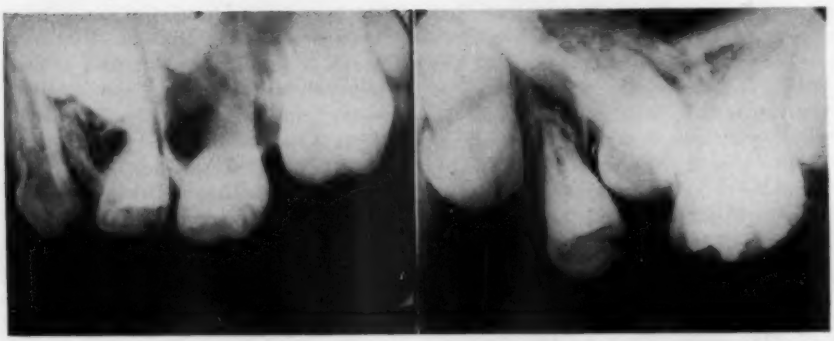

Fig. 12 • Left: Intra-osseous hemangioma in 4½ year old girl. Pretreatment roentgenogram. Note involvement of bone about the deciduous molars. Right: Roentgenogram six years later. Treatment consisted of external radiation therapy delivered in small doses over prolonged period of time. Note complete obliteration of tumor, and normal eruption pattern of permanent teeth. Interference with complete root formation of first bicuspid is seen

SUMMARY

The diagnostic criteria and the various surgical procedures indicated in the proper management of the more common benign soft tissue lesions of the oral cavity have been described. The surgical removal of any lesion occurring on the surface of the oral mucosa or projecting into the oral cavity where it is subjected to repeated traumatic injury or adverse environmental conditions is extremely important. An accurate diagnosis of the "white patches" occurring on the oral mucosa must be made since complete removal of the potentially dangerous variant is necessary. There are various methods of establishing this diagnosis, as well as various methods of treatment. The dentist should be familiar with the characteristics of the cavernous hemangioma in order to prevent serious complications resulting from improper diagnosis or treatment.

Grounding of portable electric equipment used in dental offices

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The possibility of electrical shock in modern dental offices is almost always present, unless adequate precautions are taken. The National Electric Code for many years has prescribed these precautions for fixed equipment but only recently has taken steps to cover adequately the area of portable electric equipment. This paper is an attempt to bring to the practicing dentist the latest information and reasoning on the matter so that he can examine his own office for potential electrical hazards.

DANGERS OF SHOCK

No shock, however slight, is desirable for the peace of mind of the patient or the dentist. Even a slight tingle, coming unexpectedly, might cause a reflex action which would injure the patient. A mild shock should be taken as a warning of possible severe shocks if conditions change enough to provide an easier path for current to flow.

It has been demonstrated many times that 120 volts is sufficient to kill if the conditions are right. Even if death does not result, the aftereffects of shock may hospitalize the victim for some time and require a long convalescence.

GROUNDING OF EQUIPMENT

The possibility of shock from defective electrical equipment in the average dental office is due to the nature of the normal wiring system in the United States where the alternating current service available is either 120 volts, 2-wire, or 120/240 volts, 3-wire single phase. In either case, one of the two or three wires

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is grounded at the service entrance to the building. This is accomplished by bonding the wire to be grounded to a water pipe.

The meaning of this to a person who is in a position to touch simultaneously a plumbing fixture and a bare wire is that two possibilities are present:

1. If he touches the wire which is already connected to the pipe, no shock will be experienced since there is no voltage present to cause current to flow through the victim's body.

2. If he touches the other wire which is maintained by the power system at a potential of 120 volts with respect to the grounded conductor, then an electric current can flow into the victim's body at the point of contact with the wire and out at the point of contact with the plumbing fixture. The severity of shock will be determined by the resistance of the subject—in general the firmer the contacts and the more moist the skin, the greater the shock.

But how does this apply to a normal situation? A person who would not think of touching a bare wire may do so unwittingly. This can occur where electrical equipment has an exposed metal surface. Of course the insulation inside the device is supposed to keep the electrical wires from coming in contact with the metal case, but the insulation is not always perfect. Hence, if the metal case is touched on the inside by a bare "hot" supply wire, the metal case actually will be at the same voltage with respect to ground as the "hot" wire, and will be just as dangerous.

Since the requirement for shock is the simultaneous touching of a "ground" and a "hot" wire, it will be obvious that there are many areas in a dentist's office or his home where there is little likelihood of shock since no plumbing fixtures—exposed grounded metal surfaces—are present. On the other hand, there are other areas where plumbing is present in the vicinity of electrical equipment.

What can be done to safeguard the user of electrical equipment when in the vicinity of grounded surfaces? Perhaps the safest solution is to cover up all metal surfaces with insulation. This, however, is not always practicable. Another solution is to keep all the bare metal surfaces on the electrical equipment at ground potential by connecting each one to ground with a wire. This makes it impossible for a person to touch a "hot" surface, since all metal surfaces have been previously grounded. If a defect develops inside equipment with a grounded case and the "hot" wire touches the case, a high current will flow, tripping a circuit breaker or blowing a fuse at the service box. This entails no danger to the user of the equipment as, presumably, the sparking occurs inside the case of the equipment.

The use of an extra wire for grounding purposes only would entail few difficulties for permanent equipment. On the other hand, its use with portable equipment would pose many problems. It is of interest that even today the National Electric Code still makes limited usage of the separate grounding wire connecting a portable equipment case to the nearest water pipe. The more desirable solution for most applications would be to incorporate the grounding wire in the electric cord feeding the equipment, making a total of three wires. This would require some type of three-wire plug on the end of the cord. Because most plugs in the past on light duty equipment had only two prongs and the receptacles would only accept two-prong plugs, a design was developed to keep the two-prong idea and provide for grounding. The result was a two-prong plug on the end of the cord, and a "pigtail" wire provided for connection to a grounding terminal on the receptacle box (Fig. 1). Since the equipment could be operated without connecting the grounding terminal, there was no general acceptance of this safety provision.

ACTIONS TAKEN TO REVISE NATIONAL ELECTRIC CODE

As a result of many fatal accidents due to the lack or misuse of proper grounding, the Electrical Committee of The National Fire Protection Association took cognizance of the situation and, in 1945, delegated a committee to prepare a report with recommendations for necessary changes in the National Electric Code. Also the International Association of Electrical Inspectors appointed a committee in 1947 to look into the matter and recommend a solution to the problem. The results of these efforts were embodied in the 1953 Revision of the National Electric Code and became effective January 1, 1955. These provisions are continued in the 1956 Code revision.

1956 NATIONAL ELECTRIC CODE REQUIREMENTS

A summary of the new code requirements for grounding of equipment rated 15 amperes, or less, and 125 or 250 volts is as follows:

1. The old style 2-prong plug with "pigtail" is abandoned.

2. A new 3-prong plug is required, with the third prong used for grounding having a U-shaped design such that it will not fit any previous grounding terminal or any "live" contact of any existing female receptacle.[1]

3. The dual voltage rating of plugs of the grounding and nongrounding types is no longer permitted. If an installation complies with the 1956 Code it will no longer be possible to plug 125-volt equipment into 250-volt receptacles, or 250-volt equipment into 125-volt receptacles.

A plug designed for grounding on 125 volts has two parallel blades, and a third blade for grounding. The plug to be used on 250 volts has two blades in tandem, and a third blade for grounding.[2]

4. Recognition is given, until further notice, of an adapter with parallel blades and pigtail lead on one end, and parallel slots and the new style female grounding contact on the other end.[3]

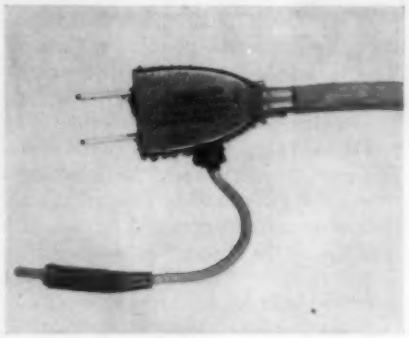

Fig. 1 • Attachment plug with flexible cord and "pigtail" grounding, prohibited after January 1, 1955

The Code requirements for grounding equipment rated more than 15 amperes utilize existing three-pole plugs with appropriate current and voltage ratings.

Figure 2 shows a number of wiring devices manufactured by Harvey Hubbell, Inc., for use in grounding under the new National Electric Code requirements. The shape and spacing of the three prongs are of particular interest. The 125-volt devices have two parallel prongs or slots. The slot size and spacing allows the new grounding receptacles to accept a standard parallel blade nongrounding plug. Hence the new design can be said to be "compatible" with past practice. Note also the tandem arrangement of blades in the 250-volt devices. It is obviously impossible to mix the two different voltage lines.

The grounding blade is longer than the other two so that the grounding connection will be made first when inserting the

1. National Electric Code, Section 2559 a, b, 4164 and 4165.
2. National Electric Code, Section 2123 b.
3. International Association of Electrical Inspectors, News Bulletin January 1954.

plug into the receptacle, before it is possible to energize the portable equipment. This feature will also cause the grounding contact to be broken last, when removing the plug from the receptacle.

The two pigtail adapters in the center of Figure 2 are approved for adapting a new 125-volt grounding plug to the old style of receptacle designed for use with a plug with the "pigtail" grounding lead. It is to be stressed that these adapters are approved only for a limited time.

METHODS OF GROUNDING

Some recognized ways of grounding 120-volt portables are shown in Figure 3.[4] Figure 3, a, shows a portable equipment supplied through an armored 2-conductor cord with the armor serving as the grounding conductor. A 3-prong grounding plug is used. Figure 3, b, shows the use of an unarmored 3-conductor cord with a 3-prong grounding plug. Figure 3, c, shows the use of an unarmored 2-conductor cord and a 2-prong plug with grounding being accomplished by the use of the third wire connected directly to ground—the water pipe. This method may be used only when part of an approved equipment or by special permission of the enforcing authority. Figure 3 also shows the ways in which the 3-pin grounding receptacle can be wired to connect it with the service entrance. Figure 3, a, shows the use of two wires inside a metal conduit or flexible armor. Figure 3, b, shows the use of three wires inside a nonmetallic sheath. Either of these is a satisfactory way of supplying a grounding receptacle from a grounding standpoint. Local building requirements may determine which should be used in a particular instance.

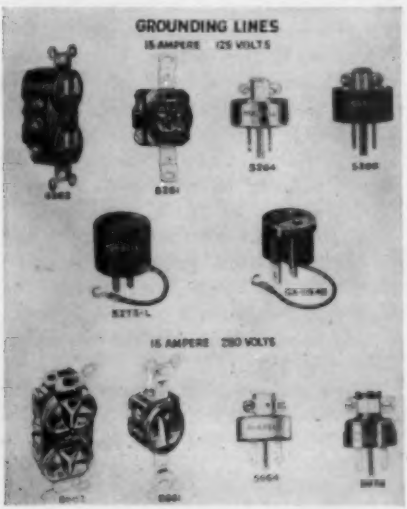

Fig. 2 • New lines of plugs, receptacles, and adapters meeting the 1956 National Electric Code grounding requirements. Note shape and spacing of three prongs. (Illustration courtesy of Harvey Hubbell, Inc.)

HAZARDS DUE TO WIRING DIFFICULTIES

It must be stressed that the presence of a grounded surface—whether a plumbing fixture or other surface intentionally grounded—presents a hazard to the user of portable electrical equipment which is supplied from the conventional grounded system unless that equipment is so insulated that it has no exposed metal surfaces. It has been shown that exposed metal surfaces on portable electrical equipment can be grounded, thus safeguarding the user. However, the question may be raised whether there are any hazards to the use of this grounding scheme and any important exceptions to its universal application.

As in any area, the more complicated the scheme, the more mistakes that can be made in its use. It follows that a 3-wire device will probably be improperly connected more often than a 2-wire device. Figure 4 illustrates some possible irregularities in the wiring when grounding 120-volt portables. It can be noted

4. National Electric Code, Section 2559 a, b, c.

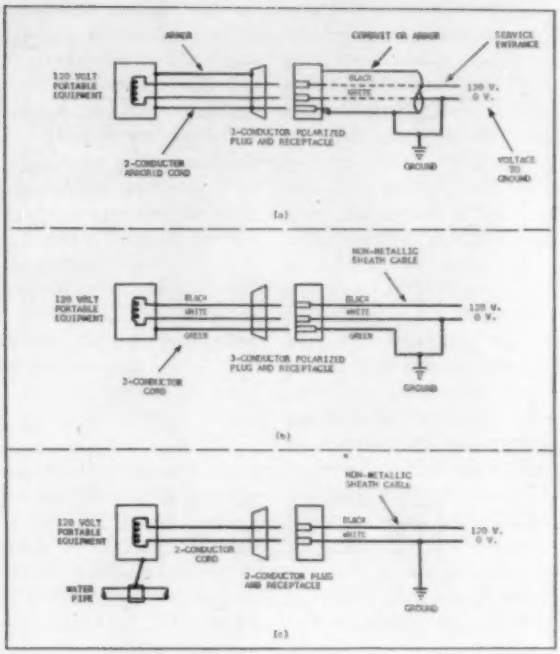

Fig. 3 • Some recognized ways of grounding 120-volt portables. a: Armored, two-conductor cord connecting portable equipment to polarized plug and receptacle. Receptacle fed by conduit or armored cable. b: Three-conductor cord connecting portable equipment to polarized plug and receptacle. Receptacle fed by three-conductor nonmetallic sheath cable. c: Two-conductor cord connecting portable equipment to nonpolarized plug and receptacle. Receptacle fed by two-conductor nonmetallic sheath cable. This method may be used only by special permission except where part of an approved portable equipment. (Illustration adapted from Inskip, L. S., and Watson, H. H. Grounding of portable electric equipment. Elect. Eng. 74:286 April 1955)

that it is possible to have irregularities in wiring either in the permanent wiring between the service entrance and the receptacle, or in the portable equipment and associated cord. Some irregularities result in nonoperation of the equipment. Others do not, and hence would be unnoticed by the user of the equipment. Only a competent electrician with adequate test equipment is capable of properly installing and testing such grounded equipment so that the user is assured of the safety which grounding is designed to give.

The need for competence in wiring and maintenance is an important reason for a notable exception in the application of grounding to portable equipment in areas where grounding might otherwise be used. This exception is residential occupancies.[5]

5. National Electric Code, Section 2545.

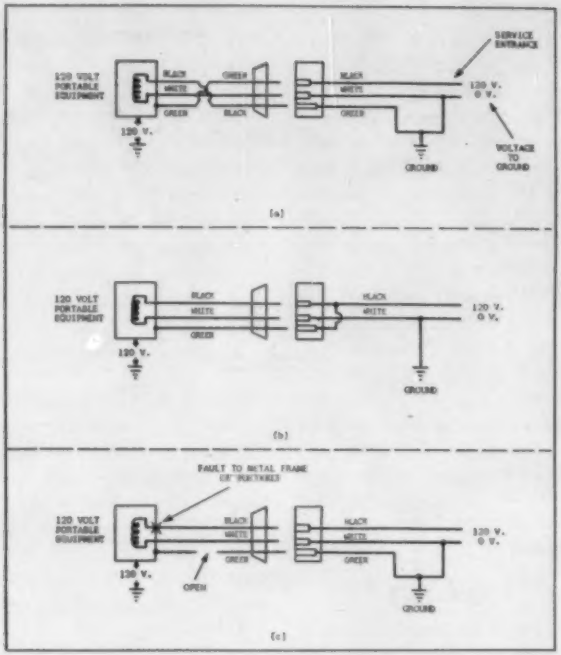

Fig. 4 • Effect of some irregularities in grounding of 120-volt portables. a: Wrong connection of black and green wires at plug. Portable will not operate and its metal frame is "hot" to ground. b: Attempt to achieve grounding at receptacle by connecting grounding terminal to neutral wire. However, grounding terminal is actually connected to "hot" wire. Portable will operate and its metal frame is "hot" to ground. c: Effect of broken or unconnected ground wire. Portable will operate and open wire can be found only by test. User will have no protection against fault shown which will make metal frame "hot" to ground. (Illustration adapted from Inskip, L. S., and Watson, H. H. Grounding of portable electric equipment. Elect. Eng. 74:286 April 1955)

TYPICAL DENTAL OFFICE GROUNDING APPLICATIONS

Certainly the dentist would want to take precautions to insure that the patient is protected from shock; the possibility of a lawsuit is always present. He is seated in a chair which, if electrically operated, should be grounded if plumbing fixtures are nearby.

If a pedestal is used which has both plumbing and electrical connections, the grounding is automatically done when metal piping is used. If, however, rubber hoses are used, an electrical grounding wire should be used to make the grounding positive.

Any equipment mounted on the pedestal such as the drill and working light is usually grounded by the pedestal ground because of the absence of insulation between the various equipments. On the other hand, if the drill and working light are separately mounted, they should be

individually grounded as long as they can be easily touched by a person in contact with grounded surfaces.

Another item which may be near the grounded equipment is the sterilizer. Thought should be given to the possibility of shock from this source while touching the patient or grounded surfaces. The solution here might be to remove the sterilizer from the grounded area or, on the other hand, to ground it.

All other electrical equipment should be examined in the light of the examples given to determine whether grounding should or should not be used.

CONCLUSIONS

Hazards from electrical shock are likely to exist in a dental office both for the patient and the dentist. These hazards can be minimized by examining each piece of equipment utilizing electricity in any way and finding the best way to prevent shock in each case. The surest way is to have all electrical equipment—located near grounded surfaces—covered with insulation so that it will have no exposed metal surfaces. The next best arrangement might be to locate the electrical equipment out of normal reach of the patient and of the dentist or team in the course of dental work, assuming that the grounded metal of the chair, its fixtures, and instruments will be unavoidably accessible to the touch. A good but less desirable arrangement is the thorough grounding of all accessible exposed metal surfaces. Adopting any of these three precautions is better than leaving matters to chance, believing that because there has been no trouble from electrical shock none should be expected.

All grounding work should be done by a competent electrician. This includes installation and maintenance. As a final suggestion, if any doubt exists as to the application of grounding in a particular situation, the local electrical inspection bureau should be consulted.

Thermal conductivity measurements of dental tissues with the aid of thermistors

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Knowledge of thermal conductivity of dental tissues would be helpful in tracing the pathways by which heat generated during cavity preparation reaches the pulp and other sensitive tissues. However, measurements of the thermal conductivity of enamel do not appear to have been reported. The published values for dentin differ widely in magnitude.[1,2] Complicated procedures had to be resorted to in order to correct for the experimental errors, and one to three days had to be allowed for the sample to reach thermal equilibrium.

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*Associate professor of biochemistry, New York University College of Dentistry.

1. Lisanti, V. F., and Zander, H. A. Thermal conductivity of dentin. J. D. Res. 29:493 Aug. 1950.

2. Phillips, R. W.; Johnson, R. J., and Phillips, L. J. Improved method for measuring the coefficient of thermal conductivity of dental cement. J.A.D.A. 53:577 Nov. 1956.

It seemed worthwhile, therefore, to explore the possibilities of a simpler method and to obtain additional thermal conductivity values for dental tissues, including the enamel. Thermistors served as temperature indicators in our study. A description of one of these devices and of the accessory circuit is given in greater than usual detail because, in spite of the advantages they offer in measurements of very small amounts of heat and temperature differences,[3] they do not seem to have found application in dental research.

CHOICE OF METHOD

The thermal conductivity values of minerals and other medium-to-poor solid conductors have often been obtained by the wall or plate method.[4-6] Briefly, the sample, in the form of a flat disk (plate), is placed between a warm and a cold copper block. The thermal conductivity is calculated readily from the observed rate of heat flow, the dimensions of the disk and the temperature difference across it, provided that the latter is held constant. This is usually done by means of an electric heater and a cold water circulator mounted inside the warm and cold block respectively.

Griffiths and Kaye[4] obtained an accuracy of 1 to 2 per cent with samples about 2 mm. thick and 45 mm. in diameter. About half an hour was required for the sample to reach temperature equilibrium, and the output of the heating coil reached the cold block with only 1 per cent loss.

Lisanti and Zander[1] and Phillips, Johnson and Phillips[2] measured the thermal conductivity of dentin by a method which was similar to that described, but the apparatus was adapted to smaller samples and otherwise differed in design from that of Griffiths and Kaye and of Birch and Clark.[5] The samples required 12 or more hours for thermal equilibrium, and difficulties were experienced in estimating the heat flow across the sample. Phillips and co-workers found the method suitable for the measurement of relative values of thermal conductivity, no longer a standard method yielding absolute values.

High accuracy seemed to be of little advantage, in view of the lack of information regarding other thermal properties of dental tissues. Our experiments, therefore, were aimed at finding a simple and rapid method by which relative values of thermal conductivity could be determined with an accuracy of 20 per cent or better. Two such attempts were made, described in this paper under the headings of Method 1 and Method 2.

The use of thermojunctions with samples of small size was likely to result in thermal leakage and other complications, because of the relatively large diameter and appreciable heat capacity of the wires. Small thermistors (temperature sensitive resistors, supplied by Western Electric Company) were used instead.

APPARATUS FOR TEMPERATURE MEASUREMENTS

Thermistor 20A, the type used in this study, is an oblong bead about 0.4 mm. in diameter, with wire leads about 0.1 mm. in diameter. The material of the bead has an unusually large temperature coefficient of electrical resistance (about — 4 per cent per degree centigrade[3]). The small size of the bead permits rapid temperature equilibrium with the surroundings. Its relatively high electrical resistance permits the use of long and thin wire connections, thus reducing

3. Dowell, K. P. Thermistors as components open product design horizons. Electr. Mfg. 42:84 Aug. 1948.
4. Griffiths, E., and Kaye, G. W. C. Measurement of thermal conductivity. Proc. Royal Soc. ser. A 104:71 Aug. 1923.
5. Birch, F., and Clark, H. Thermal conductivity of rocks. Am. J. Science 238:529 Aug. 1940.
6. Encyclopaedia Britannica, vol. 11, ed. 14. New York, Encyclopaedia Britannica, Inc., 1937, p. 329-331.

thermal leakage along the leads and adding to convenience in operation.

The electrical circuit was a conventional Wheatstone bridge (Fig. 1). R_1 and R_2 were of 1,000 ohms each. R_3 could be adjusted to match the resistance of the thermistor, T (1,700 to 3,400 ohms). G was a galvanometer with a sensitivity of 0.06 microampere per division and a period of three seconds. The working current, supplied by the 1.5 volt dry cell, B, was held at 125 microamperes with the aid of a variable resistance (a 10,000 ohm fixed resistor in series with a 3,000 ohm rheostat) and microammeter, A. The current could be turned off and the galvanometer disconnected by means of switches (not shown in Figure 1). Two thermistors could be connected alternately to the circuit through a double-pole double-throw switch at T.

In the measurements by Method 1, the temperature drift of a single thermistor had to be followed. The bridge was balanced for the initial temperature of 30° C. with the aid of R_3 (the latter consisted of a 1,000 ohm fixed resistor plus a 2,000 ohm and 200 ohm rheostat in series). Subsequent temperature changes were estimated from the galvanometer deflections (16 divisions per degree centigrade).

In the measurements made by Method 2, the equilibrium temperatures of two portions of the thermal conductivity apparatus had to be read. The thermistors were calibrated first over the desired range by immersion in a temperature-controlled bath whose temperature was read to 0.01° C. with a certified mercury thermometer. R_3 (Fig. 1) consisted of decade resistance boxes (from Leeds and Northrup Company, Philadelphia). The electrical resistance of the thermistors was readily determined to $\pm$ 1 ohm, corresponding to 0.01 to 0.014° C.

With the exception of Leeds and Northrup precision resistance boxes and the galvanometer, the other bridge components can be obtained from radio stores at a moderate cost. Wire wound resistors should be used, with a power dissipation of 5 or more watts. The thermistors are available commercially from several sources, for instance from Victory Engineering Corporation, Union, N. J.

METHOD ONE

Theory • The difficulties of estimating the heat flow across the sample from the heat output of the warm block have been bypassed in the following method which gave good results in the hands of two investigators.[7, 8]

Heat is not supplied to the warm block, but its temperature is allowed to decline as heat flows across the sample. The following equation can be expected to hold, provided that the experiments are confined to a narrow temperature range:[7]

Equation 1

$$d \ln G = - S \, dt$$

where G is the temperature difference across the sample, t is time and S is a constant whose value depends on thermal conductivity and dimensions of the sample and on heat capacity of the warm block.

In our measurements G was allowed to decline from 5° to 3° C., and the time required was noted. Integration of Equation 1 between these limits gives:

Equation 2

$$\ln 5 - \ln 3 = St$$

The area of the samples was calculated from the radius (= 2 mm.). The total heat capacity of the block was calculated from the weight of its components and

7. Stephens, R. W. B. On a new method for the measurement of the thermal conductivity of poor and medium conducting materials. Philos. Mag. 15:857 May 1933.

8. Fitch, A. L. New thermal conductivity apparatus. Am. Physics Teacher 3:135 Sept. 1935.

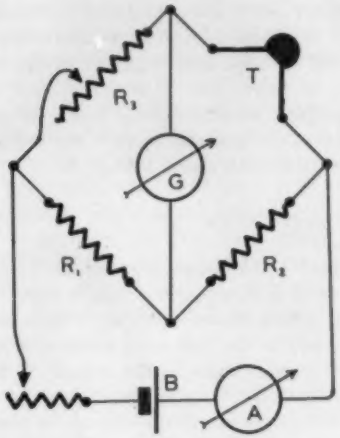

Fig. 1 • Thermistor and resistance bridge

their specific heat values. On substitution of the numerical values into Equation 2 and completion of the calculations, the equation reduced to:

Equation 3

$$k = 0.142 \times \frac{l}{t}$$

where k is the thermal conductivity and l the thickness of the sample. The calculations did not take into account the effect of heat exchanges between the block and its mount, and of other experimental errors, on the rate of cooling. A corrected value of the apparatus constant therefore was obtained by calibration against water, as explained in the following section.

Experiment • Slices of enamel and dentin were cut from molars with a diamond disk and finished on flat stones by hand. The resulting samples were disks 4 mm. in diameter and 0.6 to 1 mm. thick. The thickness and diameter were checked with the aid of a micrometer screw and ocular micrometer scale respectively, and variations were kept within $\pm \frac{1}{2}$ per cent.

The warm block was a brass cylinder 4 mm. in diameter. A deep groove was cut in the block and continued through the cork[9] mount (Fig. 2 and 3). A thermistor 20A, with the leads varnished to prevent leakage of electricity was placed in the groove, and copper dust was packed around it to ensure good heat transfer. The leads were extended to miniature clamps; copper wires no. 38 were soldered to the latter. A Bakelite tube about 2 inches long served as a support and additional insulation. A shallow cylindrical space within the cork mount, below the block, served as the sample chamber. The exposed cork surfaces were smoothed and coated with wax.

The cold block (part C of Figure 5), also 4 mm. in diameter, was attached to a thick copper plate, whose upper sur-

9. National Research Council. International critical tables of numerical data, physics, chemistry and technology, vol. 2. New York, McGraw Hill Book Co., Inc., 1927, p. 315.

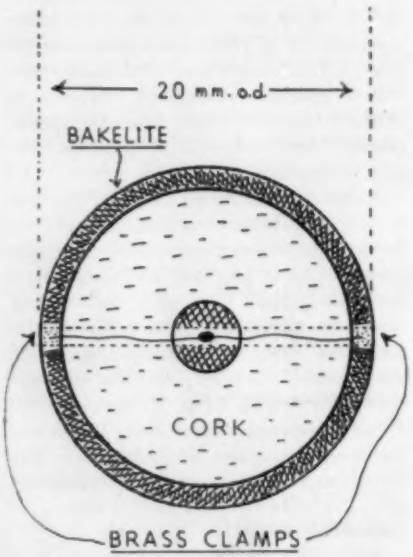

Fig. 2 • Warm block and cork mount viewed from above (method 1)

face was insulated with wood and waxed cardboard. The insulation was level with the top of the block when the sample chamber contained water or soft tissue. With solid samples, sufficient covering was removed to permit the cold block to enter the chamber and come in contact with the sample.

In preparation for the readings, the sample holder (Fig. 3) was turned upside down and the chamber filled with water. The solid sample, if any, was inserted and the cold block placed on top. The apparatus was turned over, and the copper plate was immersed in a bath at 32°. After about 15 minutes, the apparatus was transferred to a bath at 25.0°. The time interval between the 30° and 28° reading was determined with the aid of an electric stop watch.

At least three time readings were taken with each sample. If they varied by more than 0.3 second, it was assumed that the sample was not in good thermal contact, and the measurements were repeated after reassembling the apparatus. With water as the sample, the average was 15.1 ± 0.2 seconds. The depth of the chamber (= thickness of the sample) was 0.122 cm. The resulting value of k was about 20 per cent lower than the accepted value[10] of 1.43 x 10^{-3} centimeter gram second (c.g.s.) units at 27°. The constant in Equation 3 therefore was increased to correspond with the accepted value of k for water:

Equation 4

$$k = 0.177 \times \frac{l}{t}$$

Thermal conductivity of two samples of dentin and two of enamel was measured by this method; the results are given in the table. Since the k values approached that of water, it was hoped that the experimental errors were largely canceled by the calibration and that Equation 4 would hold. However, objections might be advanced against the use of water as the standard substance because of the possibility of convection (although the warm surface of the sample was at the top). The values for enamel therefore were checked by Method 2.

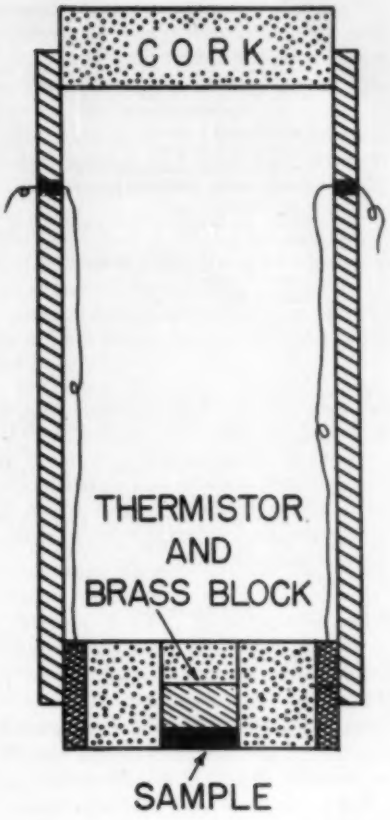

Fig. 3 • Sample holder (method 1)

METHOD TWO

Theory • A simple method, by means of which the thermal conductivities of an

10. National Research Council. International critical tables of numerical data, physics, chemistry and technology, vol. 5. New York, McGraw Hill Book Co., Inc., 1929, p. 227, 228.

Table • Thermal conductivity of dental tissues. Conductivity (k) values are in c.g.s. units

Description of samples	$k \times 10^3$	Reference
Ivory, cut at right angle to axis	1.08-1.25 at 80°	Griffiths and Kaye[4]
Ivory, cut parallel to axis	1.37 at 80°	Griffiths and Kaye[4]
Dentin (seven samples)	2.10-2.49	Lisanti and Zander[1]
Dentin (four? samples)	0.257 (mean value)	Phillips and co-workers[2]
Root dentin, cut parallel to tubules	0.96 at 29°	Method 1
Crown dentin, cut nearly parallel to tubules	1.07 at 29°	Method 1
Enamel, cut nearly parallel to rods	1.51 at 29°	Method 1
Same sample	1.58 at 26°	Method 2
Enamel; rods at varying angle to section surface	1.50 at 29°	Method 1
Same sample	1.62 at 26°	Method 2

unknown and a standard sample can be compared, has been used by Reulos.[11] If two disks of equal diameter are placed in series between a warm and a cold block, the following relationship will obtain if the temperature difference between the blocks is held constant:

Equation 5

$$k_2 = k_1 \times \frac{G_1 l_2}{G_2 l_1}$$

where G_1 and G_2 are the temperature drop across the first and second sample respectively, l_1 and l_2 the thickness and k_1 and k_2 the thermal conductivity values.

Pyrex glass seemed to be the best available standard substance, since its thermal conductivity approached that of the dental tissues. The values for 25°, obtained by interpolation from the data of Stephens[12] and of Birch and Clark[5] were 2.55×10^{-3} and 2.95×10^{-3} c.g.s. units respectively. Since the composition of the glass used by Stephens was close to that recently reported by the manufacturer,[13] the average of the values given was taken as the standard value. The manufacturer's value[13] (method not given) is 2.8×10^{-3}.

Experiment • The setup is shown in Figure 4 and 5. The temperature of the warm block W was held near 30° by circulating water from a thermostat through the cup; a thermistor 20A served as the temperature indicator. The cold block C was immersed, to the level of the insulation, in a bath at 19 to 20°, read to 0.01° with a mercury thermometer. The temperature at the junction of the two samples was determined by inserting between them a 1.5 mm. thick copper disk containing a second thermistor. Because of the high thermal conductivity of copper,[14] the temperature gradients within it were assumed to be negligible.

The thermistor leads were soldered to no. 38 wires and the latter connected to leads from the bridge through clamps.

The Pyrex disk was joined to the cold block with molten wax and pressed firmly in position; the adjustments were observed through a x 10 magnifier. The copper disk was similarly mounted on top of the glass. Glycerol was used as the junction liquid with the enamel sample. Finally, the warm block was lowered

11. Reulos, R. Méthode pour la mesure de la conductivité calorifique des verres. Revue d'Optique 10:266 June-July 1931.

12. Stephens, R. W. B. Temperature variation of thermal conductivity of Pyrex glass. Philos. Mag. 14:897 Nov. 1932.

13. Corning Glass Works, Bulletin B-83, Properties of selected commercial glasses. Corning, N. Y., Corning Glass Works, 1949, p. 3, 6.

14. Handbook of chemistry and physics, ed. 35. Cleveland, Chemical Rubber Publishing Co., 1953-1954, p. 2086.

onto the enamel disk and surplus glycerol blotted off. A trace of a surfactant (Nacconol Z, from National Aniline Company) facilitated the spreading of glycerol on copper surfaces.

The readings could be made after about half an hour. The room temperature was 20 to 21°. In a preliminary check of the method, both samples were of Pyrex glass; the readings were repeated after interchanging the samples. The observed values of G_1/G_2 were 1.17, 1.23 and 1.19, averaging 1.20, hence in good agreement with the observed thickness ratio of 1.21.

A representative set of readings made at 15 minute intervals with an enamel sample (without readjustment of the sample) and calculations of the k value therefrom are given:

Room temp.	21.0°	20.6°	20.7°
Warm block temp.	29.79°	29.85°	29.87°
Midpoint temp.	22.61°	22.67°	22.76°
Cold block temp.	18.22°	18.27°	18.30°

Pyrex sample: $G_1 = 4.38°$, $l_1 = 0.092$ cm., $k_1 = 2.75 \times 10^{-3}$.

Enamel sample: $G_2 = 7.17°$, $l_2 = 0.096$ cm.

Hence from Equation 5, $k_2 = 1.56 \times 10^{-3}$ c.g.s. units.

DISCUSSION OF RESULTS

The results obtained by Methods 1 and 2 are shown in the table, together with the values reported by earlier investigators.

The large divergence between the values obtained by Lisanti and Zander for dentin and those of Phillips and coworkers can hardly be due to conductivity variations within that tissue, since neither group of investigators observed a comparable difference among their samples.

The agreement between Method 1 and 2 was sufficiently close, considering the accuracy usually obtained in thermal conductivity measurements.

Our values for the enamel samples are slightly higher, and those for dentin 30 to 40 per cent lower, than the accepted value for water. A set of readings by Method 1 gave 1.79×10^{-3} c.g.s. units as the thermal conductivity of a gingival tissue sample. Dentin thus appears to be a poorer conductor than the surrounding tissues and fluids, but the differences are not large.

When heat is produced intermittently, as during the preparation of a cavity, the rate of temperature rise depends on heat capacity of the medium as well as on thermal conductivity. Accurate conductivity values, therefore, would not be of advantage in interpreting the observed temperature changes without the knowledge of specific heat values.

Method 2 offers more possibilities of improvement than Method 1. A gain in accuracy and convenience would result from better provisions for leveling and centering the warm block and from mounting a thermistor in the cold block. Variations in the thickness and diame-

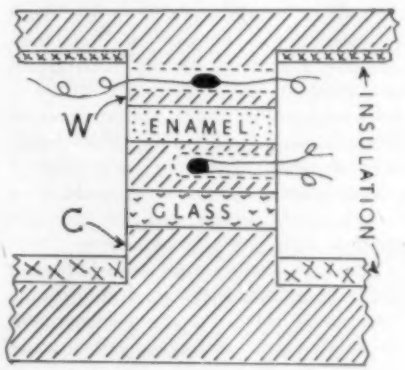

Fig. 4 • Arrangement of samples and thermistors in method 2

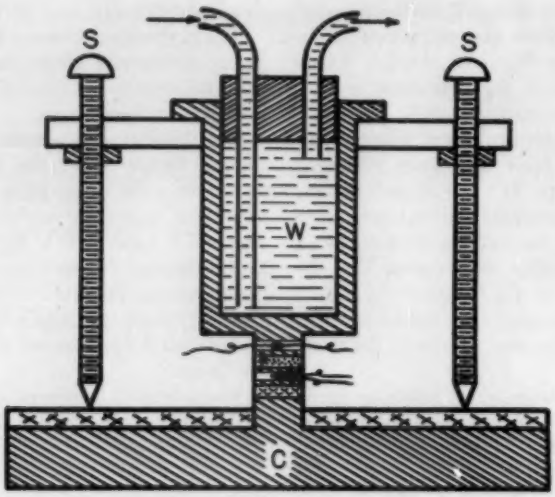

Fig. 5 • Apparatus (method 2)

ter of the sample would probably be less easy to reduce than the instrumental errors.

The use of thermistors proved to be of great advantage. The cross sectional area of thermocouple wires, such as were used by earlier investigators,[15] was 10 to 25 times greater than that of the thermistor leads. The thermal leakage, and the inconvenience, associated with the use of such wires would have been increased correspondingly. Because of high temperature sensitivity of the thermistors, measurements could be made within a short temperature range, not far removed from the room temperature, which facilitated thermostatic control. A tenfold or greater increase in sensitivity could have been made if needed with the aid of a multiple reflection galvanometer.

The high temperature sensitivity and small size and heat capacity of thermistors recommend them for the measurement of small and transient temperature changes.

SUMMARY

Two methods for the measurement of thermal conductivity of dental tissues were tested. The method recommended is based on the readings of temperature differences across a standard and a dental tissue sample placed in series.

Two enamel samples had a thermal conductivity of 0.00155 and 0.00156 c.g.s. units respectively, with an estimated error of 12 per cent.

Two dentin samples had a thermal conductivity of 0.00096 and 0.00107 respectively, with an estimated error of about 20 per cent; thus the values were nearer those of Lisanti and Zander[1] than those of Phillips, Johnson and Phillips.[2]

The use of thermistors in the measurements proved to be of great advantage, because of their high temperature sensitivity and small size and heat capacity.

15. Phillips, R. W.; Reinking, R. H., and Phillips, L. J. Thermal conductivity of dental cement. J. D. Res. 33:511 Aug. 1954.

Secondary radiation and the dentist

Albert G. Richards, M.S., Ann Arbor, Mich.

Secondary radiation is produced whenever a body of matter is exposed to roentgen-ray radiation. Most of the secondary radiation present in a dental office originates at the face of the patient; however, the air, the dental equipment and anything else lying in the path of the useful beam of roentgen rays will also emit secondary radiation. Secondary radiation scatters in all directions from its place of origin while the x-ray machine is operating, and ceases when the exposure is terminated.

For purposes of clarity, the following definitions of symbols are included:

1. The unit of quantity of roentgen-ray radiation is the "roentgen," designated by the symbol "r."

2. The unit of electrical pressure applied to an x-ray tube is the "peak kilovolt" designated by the symbol "kvp."

3. The unit of quantity of electrical current passing through an x-ray tube is the "milliampere," designated by the symbol, "ma."

4. The unit of daily usage of an x-ray machine is the $\frac{\text{"ma. sec."}}{\text{day}}$. This unit is the product of the number of milliamperes of current flowing through an x-ray tube and the number of seconds that the machine is operated per day.

The National Committee on Radiation Protection[1-3] has issued recently revised recommendations relative to permissible radiation exposures of persons who are occupationally exposed to radiation. The net effect of these recommendations is to reduce the average basic maximum exposure limit from 0.3 to 0.1 r per week. In light of present knowledge, the exposure of one who is exposed occupationally to roentgen-ray radiation at the rate of 0.100 r per week, is not expected to cause detectable bodily injury at any time during his lifetime.

If a dentist always avoids the path of the useful roentgen-ray beam and if the manufacturer of his x-ray machine has built the head of the machine properly so as to keep leakage radiation below the recommended limits for diagnostic x-ray machines,[4] then the only major source of radiation that presents any appreciable hazard to the dentist is the secondary radiation that scatters from the patient's head. The recommended limits[4] for diagnostic x-ray machines are as follows:

This investigation was supported, in part, by research grant No. D-386 from the National Institute of Dental Research, National Institutes of Health, U. S. Public Health Service.

Associate professor of dentistry, School of Dentistry, University of Michigan.

1. Morgan, K. Z. Recent changes in maximum permissible exposure values. Presented before the 1957 Nuclear Congress, Philadelphia, March 12, 1957. Unpublished.

2. Taylor, L. S. Current situation with regard to permissible radiation exposure levels. Radiology 69:6 July 1957.

3. National Committee on Radiation Protection and Measurement. Maximum permissible radiation exposure to man. Preliminary statement, Jan. 8, 1957. Unpublished.

4. U. S. Department of Commerce. X-ray protection. National Bureau of Standards Handbook 60. Washington, D. C., Government Printing Office, 1955.

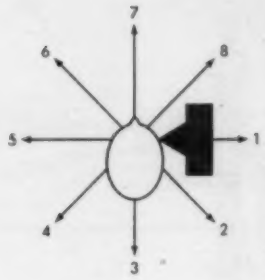

Table 1 • Scattered secondary radiation as a function of direction, distance and tube voltage

Direction	Distance in feet	Secondary radiation		Ratio
		65 kvp mr/sec.	90 kvp mr/sec.	(mr/sec.) 90 kvp / (mr/sec.) 65 kvp
1	2	0.075	0.190	2.53
1	3	0.040	0.130	3.25
1	4	0.035	0.095	2.71
1	5	0.025	0.070	2.80
1	6	0.020	0.050	2.50
2	2	0.245	0.540	2.20
2	3	0.110	0.240	2.18
2	4	0.060	0.136	2.27
2	5	0.038	0.088	2.32
2	6	0.027	0.062	2.30
3	2	0.067	0.160	2.39
3	3	0.0325	0.078	2.40
3	4	0.018	0.044	2.44
3	5	0.012	0.028	2.33
3	6	0.0075	0.020	2.67
4	2	0.076	0.210	2.77
4	3	0.035	0.098	2.80
4	4	0.022	0.0625	2.84
4	5	0.015	0.046	3.07
4	6	0.010	0.032	3.20
5	2	0.900	3.15	3.50
5	3	0.463	1.52	3.29
5	4	0.290	0.98	3.38
5	5	0.203	0.68	3.35
5	6	0.150	0.48	3.20
6	2	0.225	0.550	2.44
6	3	0.104	0.243	2.34
6	4	0.058	0.138	2.38
6	5	0.037	0.088	2.38
6	6	0.024	0.062	2.58
7	2	0.237	0.550	2.32
7	3	0.108	0.243	2.25
7	4	0.062	0.142	2.29
7	5	0.038	0.090	2.37
7	6	0.026	0.062	2.39
8	2	0.345	0.760	2.20
8	3	0.152	0.333	2.19
8	4	0.082	0.184	2.24
8	5	0.053	0.120	2.27
8	6	0.036	0.083	2.31

Diagnostic type protective tube housing. One that reduces the leakage radiation to at most 0.10 r/hr at a distance of 1 m from the tube target when the tube is operating at its maximum continuous rated current for the maximum rated voltage.

AMOUNT OF SECONDARY RADIATION

An experiment was devised to determine the amounts of secondary radiation that are scattered in various directions from the head of the patient. As a substitute for a living head, and as a test object on which many exposures could be made without any fear of movement or biological damage, a human skull was filled and coated with wax to simulate the human features. The scattering of roentgen rays by this phantom head closely duplicated the scatter from living heads.

The phantom head was positioned during the following experiments with its occlusal plane lying horizontally and located 48 inches above the floor.

For the first series of measurements of the amount of secondary radiation that was scattered by the phantom head, an x-ray machine was operated with 65 kvp and 10 ma. with the short pointed cone touching the simulated cheek. The central ray of the x-ray beam was directed parallel to the floor, at the occlusal surfaces of the first molars, and perpendicular to the median sagittal plane. At dis-

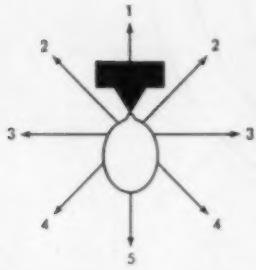

Table 2 • Scattered secondary radiation as a function of direction, distance and tube voltage

Direction	Distance in feet	Secondary radiation		Ratio
		65 kvp mr/sec.	90 kvp mr/sec.	(mr/sec.) 90 kvp / (mr/sec.) 65 kvp
1	2	0.100	0.300	3.00
1	3	0.070	0.200	2.86
1	4	0.045	0.140	3.11
1	5	0.025	0.100	4.00
1	6	0.020	0.070	3.50
2	2	0.290	0.610	2.10
2	3	0.133	0.283	2.13
2	4	0.071	0.164	2.31
2	5	0.047	0.112	2.38
2	6	0.033	0.075	2.27
3	2	0.195	0.460	2.36
3	3	0.087	0.208	2.39
3	4	0.050	0.120	2.40
3	5	0.031	0.076	2.45
3	6	0.021	0.054	2.57
4	2	0.188	0.475	2.53
4	3	0.083	0.220	2.65
4	4	0.047	0.130	2.77
4	5	0.030	0.084	2.80
4	6	0.021	0.056	2.67
5	2	0.510	1.433	2.81
5	3	0.273	0.820	3.00
5	4	0.176	0.540	3.07
5	5	0.120	0.363	3.03
5	6	0.086	0.263	3.06

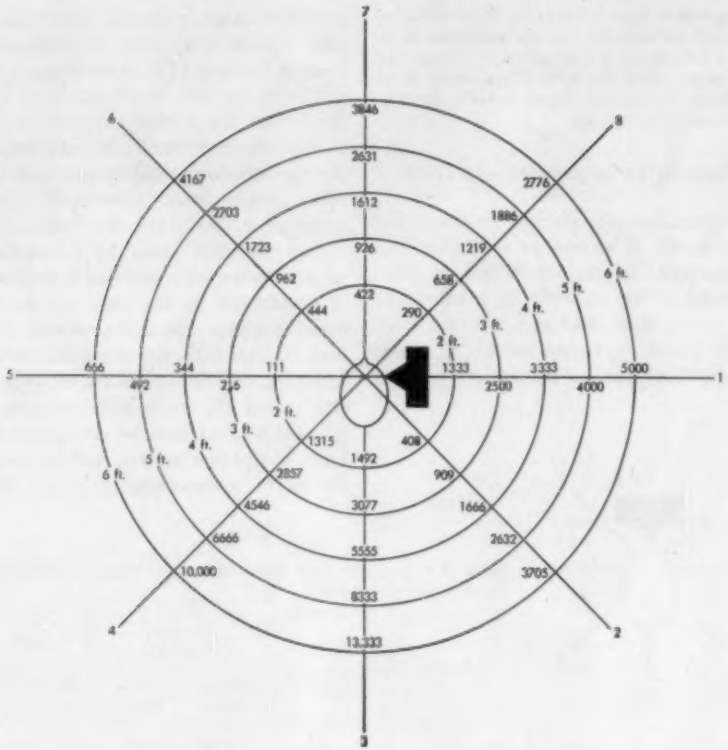

Fig. 1 • Number of one second exposures that a dentist could make in a week without exposing himself to more radiation than the maximum permissible dose for one week. Technical factors: 65 kvp; 10 ma; total filtration equivalent to 2.25 mm. of aluminum; 2.75 inch diameter of useful beam at tip of short cone (7 inch target-skin distance)

tances of 2, 3, 4, 5, and 6 feet from the point where the central ray crossed the median sagittal plane, measurements were made of the amount of secondary radiation that scattered at angles of 0, 45, 90, 135 and 180 degrees with respect to the direction of the central ray. A Victoreen Minometer with a 1 mr ionization chamber was used to measure the secondary radiation present at each location. This ionization chamber was cylindrical, 4.5 inches long and 4.5 inches in diameter. All of the measurements were made at 48 inches from the floor, the same distance that the occlusal plane of the phantom head was situated from the floor (Table 1).

A second series of measurements was made in the same manner as the first, but with the x-ray machine operated with 90 kvp (Table 1). A third and fourth series of measurements (Table 2) were made with 65 and 90 kvp respectively, but with the central ray of the x-ray beam directed horizontally at the incisal edges of the central incisors and along the median sagittal plane. At all times, the x-ray machine was operated with total filtration equivalent to 2.25 mm. aluminum and with a beam measuring 2.75

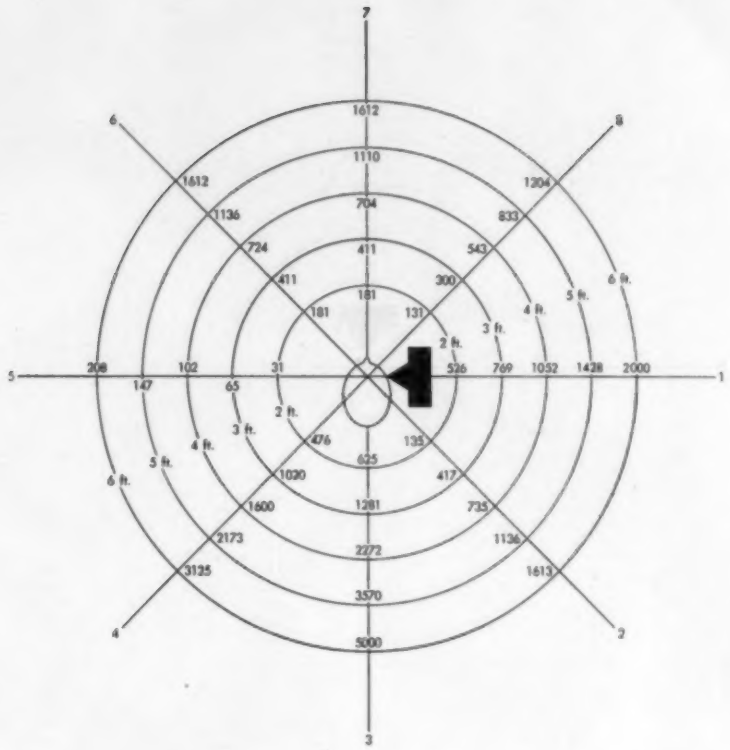

Fig. 2 • Number of one second exposures that a dentist could make in a week without exposing himself to more radiation than the maximum permissible dose for one week. Technical factors: 90 kvp; 10 ma; total filtration equivalent to 2.25 mm. of aluminum; 2.75 inch diameter of useful beam at tip of short cone (7 inch target-skin distance)

inches in diameter at the tip of short pointed cone (target-skin distance equal to seven inches).

In general, it was found that the intensity of the scattered radiation at each location was a maximum when measured 48 inches from the floor. However, this observation did not hold for the 180 degrees direction (directly behind the head of the x-ray machine). Here the intensity of the scattered radiation was a minimum when measured 48 inches from the floor. At both greater and lesser distances than 48 inches from the floor, the intensity of the scattered radiation increased as much as tenfold when the ionization chamber was located above or below the shadow of the head of the x-ray machine. The amounts of scattered secondary radiation that are listed for direction 1 in Tables 1 and 2 are ten times the amounts that were measured 48 inches from the floor.

The number of one-second exposures that a dentist could make in a week without exposing himself to more radiation than the weekly maximum permissible dose was determined by dividing 0.100 r by the amounts of radiation listed in Tables 1 and 2. The result of these cal-

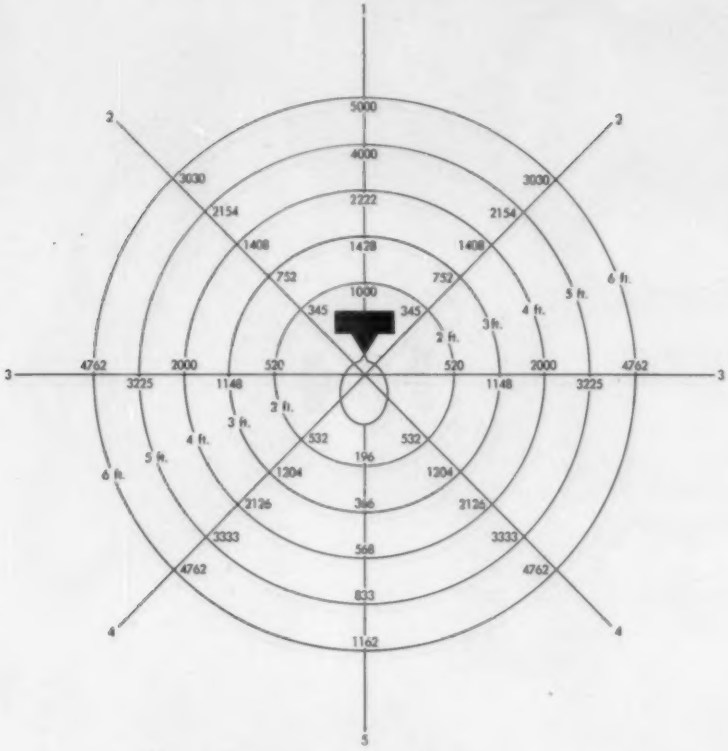

Fig. 3 • Number of one second exposures that a dentist could make in a week without exposing himself to more radiation than the maximum permissible dose for one week. Technical factors: 65 kvp; 10 ma; total filtration equivalent to 2.25 mm. of aluminum; 2.75 inch diameter of useful beam at tip of short cone (7 inch target-skin distance)

culations appear in Figures 1, 2, 3, and 4.

Figures 1 through 4 indicate that it is safer for the dentist to be at certain locations, with respect to the patient, than at others. The most hazardous location for the dentist is in the path of the useful x-ray beam. This location should be avoided always. The 135 degree location is the next most hazardous location.

The safest positions for the operator of a dental x-ray machine during the exposure of dental films are:

1. Behind the head of the x-ray machine.

2. At right angles to the direction of the x-ray beam.

When the right angle location permits a choice of staying behind or in front of the patient, the far safer position is behind him.

By applying the inverse square law to the values listed for direction 8 in Figures 1 and 2 (which is the most hazardous direction outside of the useful x-ray beam) daily permissible workloads (Table 3) can be established for various distances which separate the operator from the patient, and for the two voltages investigated.

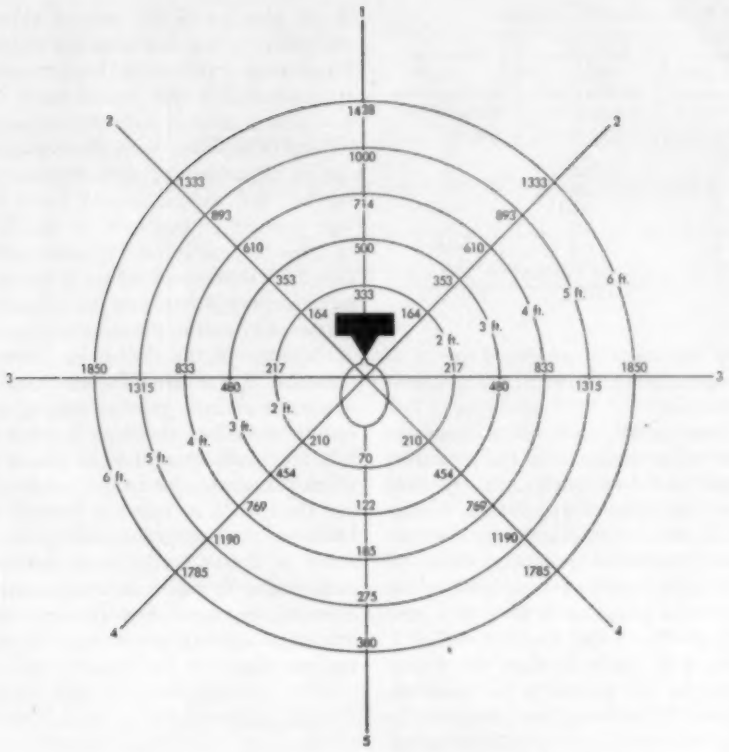

Fig. 4 • Number of one second exposures that a dentist could make in a week without exposing himself to more radiation than the maximum permissible dose for one week. Technical factors: 90 kvp; 10 ma; total filtration equivalent to 2.25 mm. of aluminum; 2.75 inch diameter useful beam at tip of short cone (7 inch target-skin distance)

The data in Table 3 apply to dental x-ray machines operated with 10 ma., total filtration equivalent to 2.25 mm. of aluminum and the beam measuring 2.75 inches in diameter at the tip of short cone (target-skin distance equal to 7 inches).

If no lead diaphragm were used to limit the diameter of the x-ray beam to 2.75 inches and the total filtration were only equivalent to 0.5 mm. of aluminum, then the permissible daily workloads would be about one quarter of the values listed in Table 3.

In many dental offices, a longer cord on the timer would allow the operator to move further away from the patient than is possible with the present cord and thus take advantage of the greater safety afforded by the increased distance. It should always be remembered that safety increases with the distance from the patient. The careful operator should always strive to keep his daily exposure as far below the permissible dose and as close to zero as is possible.

The production of secondary radiation increases with the tube voltage. The data in Tables 1 and 2 indicate a ratio of approximately 2 to 3 times as much sec-

Table 3 • Daily permissible workloads

Distance between patient and operator (in feet)	Permissible daily workload with 65 kvp (in sec.)	Permissible daily workload with 90 kvp (in sec.)
2	60	25
3	140	60
4	240	105
5	380	165
6	540	240
8	960	425
10	1,500	665

ondary radiation is produced per unit time when using 90 kvp, as compared with 65 kvp.

In general, the higher the voltage, the greater is the tendency of the secondary radiation to be scattered in a generally forward direction. This tendency is suggested by the increase in the ratio of the scattered radiation produced with 90 kvp to that produced with 65 kvp, in passing from direction 2, to 3, to 4, and 8, to 7, to 6 in Table 1 and direction 2, to 3, to 4 in Table 2. Also, the higher the voltage, the greater is the penetrating power of the secondary radiation. In each of the previously mentioned directions, the ratio is seen generally to increase with distance, thus suggesting that the secondary radiation with 65 kvp is attenuated to a greater degree by the layers of air involved than is the secondary radiation which is generated with 90 kvp.

The amount of exposure of the dentist by secondary radiation can be expressed as the product of the rate of exposure multiplied by the length of the exposure. To produce comparable roentgenograms, approximately 40 per cent as much exposure time is needed with 90 kvp as with 65 kvp. Therefore, with 65 kvp, a unit rate of secondary radiation exposure acting for one second, would result in a unit amount of exposure of the dentist by secondary radiation. However, with 90 kvp, a 2.5 times greater rate of secondary radiation exposure acting for 0.4 seconds, also would result in the same unit amount of exposure of the dentist by secondary radiation. Locations (Tables 1 and 2), where the ratio or relative rate of exposure by secondary radiation is more than 2.5, are more hazardous to the dentist when he operates the x-ray machine at 90 kvp than when he operates with 65 kvp. However, the permissible daily workloads listed in Table 3 contain a sufficiently large factor of safety to compensate for increased exposure of the dentist at those few more hazardous locations when 90 kvp are used.

SUMMARY

The exposure of the dentist by secondary radiation can be kept within permissible exposure levels by his remaining in certain favored locations and at an adequate distance from the patient during the operation of the x-ray machine. Specific recommendations have been made that will achieve the desired protection for the dentist.

Education and the Ability to Think • Education is not to teach men facts, theories or laws, not to reform or amuse them or to make them expert technicians. Education is to unsettle their minds, widen their horizons, inflame their intellect, teach them to think straight, if possible, but to think nevertheless. ***Robert Maynard Hutchins.***

Dimensional stability of rubber base impressions and certain other factors affecting accuracy

Richard J. Schnell, D.D.S., and Ralph W. Phillips,† M.S., Indianapolis*

Many of the variables which influence the accuracy of the rubber base impression have yet to be defined clearly. Certain factors have been studied, and that research has led to some standardization of technic.[1-7]

One of the claims made by many of the manufacturers of these materials is that they have excellent dimensional stability. Skinner and Cooper,[1] with limited tests, found the distortion with time to be minimal. Sturdevant[2] and Fairhurst and coworkers[5] also believed that the stability was good. None of this research, however, was adequately exhaustive to evaluate this variable for the different commercial materials or to establish which factors might influence the dimensional stability of the impression.

PROCEDURE

Five rubber base materials (see the table) purchased on the open market were studied. Considerable variation exists in different batches or even in different tubes from the same batch.[3] Likewise, continued formula changes can be anticipated during the immediate future. However, it is not the purpose of this paper to indicate any superiority with a particular brand but rather to evaluate certain variables which are common to all of them.

Three master models were employed. One of these was the Bureau of Standards MOD steel die, from which approximately 600 impressions were taken. The second model included four Dentoform teeth, prepared for a three-quarter crown, full crown, MODBL inlay and DO inlay. Approximately 60 impressions were taken of this latter model. The third model was a maxillary molar (Dentoform) with a long, parallel wall MOD cavity preparation. Rigid metal and plastic bands, with a 2 mm. hole in the top, were used in taking impressions of the steel die and the single Dentoform tooth. A Getz no. 7 plastic tray and a specially formed acrylic tray were used for the Dentoform model. Storage mediums for the impressions included air, water and approximately 100

This research was supported in part by a grant (D-433) from the National Institute of Dental Research, National Institutes of Health, U. S. Public Health Service.

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2. Sturdevant, C. M. Impressions for indirect inlays. J.A.D.A. 54:357 March 1957.

3. Miller, W. A. C., and Dickson, G. Physical properties of the synthetic rubber base impression materials. Internat. A. D. Res. Preprinted Abs. 84 March 24, 1956.

4. Bailey, L. R. Acrylic resin tray for rubber base impression materials. J. Pros. Den. 5:648 Sept. 1955.

5. Fairhurst, C. W., and others. Elastic properties of rubber base impression materials. J. Pros. Den. 6:534 July 1956.

6. Pearson, S. L. New elastic impression material: a preliminary report. Brit. D. J. 99:72 Aug. 2, 1955.

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Table • Rubber base impression materials tested

Brand	Manufacturer	Batch no.
Coe-Flex	Coe Laboratories, Inc.	B-3
Form-Flex	The William Getz Corp.	621
Permlastic	Kerr Manufacturing Co.	NN999-624-NN64-0 642-NN240-NN301-0 LL262LL167532 LL986MM123583 641NN232NN243-0
Heavy body Permlastic	Kerr Manufacturing Co.	MM779MM794614 MM765MM794514 MM680MM794614
Sta-Tic	Stalite, Inc.	

per cent humidity. All materials were weighed for proportioning and were mixed 45 to 60 seconds on paper mixing pads.

In the single mix procedure, a portion of the mix was placed in the band, another portion of the same mix forced into the cavity preparation and the shell seated within three minutes from the start of spatulation. The die and the impression were returned to the humidifier, which was maintained at 98°F., for an additional seven minutes. The impression thus was removed at ten minutes from the initiation of the mixing procedure.[8]

In the "double mix" technic, the first mixture was used to fill the tray or band. A second mix was made and applied to the preparation. Two minutes intervened between the initiation of the two mixes. The tray or shell containing the partially set first mix was now seated and the model and impression transferred to the humidifier. After standing for whatever length of time was necessary to total ten minutes from the beginning of spatulation of the second mix, the impression was snapped from the model.

Coe-Flex adhesive was used in all instances to bond the impression material to the tray or shell. Since some of the impression materials tend to stick to the models, wax in a petroleum base solvent was painted on the models and allowed to dry before taking the impression.

Three sizes of bands were used in taking the impressions of the steel die; they were selected so that the thicknesses of material between the buccal or lingual aspect of the die and band were 0.5, 2.0 and 4.5 mm. The band was seated in such a manner that a uniform thickness of material surrounded the die. The specially constructed acrylic trays used for the series of multiple preparations permitted a 2 or 3 mm. thickness of the impression materials. All the dies were made from Vel-Mix at a constant water-powder ratio. Castings were not tried back on the stone die for at least 24 hours. A minimum of four impressions were made for each series of tests, and the results are the mean. Results on duplicate specimens were generally rather uniform. In approximately 75 per cent of the samples, the variation from the mean was ± 10 per cent.

When the steel die was used, distortion or accuracy was measured by transferring a snugly fitting casting from the master model to the Hydrocal die. Thus, the casting was the control—a technic used in other investigations.[8,9] The distance in millimeters by which the casting failed to seat fully on the stone die under a 1

8. James, A. G. Maintenance of equilibrium in reversible hydrocolloid impressions. I. Made with stock impression materials. J.D. Res. 28:108 April; II. Made with materials supplied by the manufacturers for testing. 28:119 April; III. Report on tests made with five stock impression materials. 28:447 Oct. 1949.

9. Phillips, R. W., and Ito, B. Y. Factors influencing the accuracy of reversible hydrocolloid impressions. J.A.D.A. 43:1 July 1951.

pound load is the measured value to be used throughout this paper.

Naturally, if the stone die, and thus the original impression, has reproduced perfectly the original model, then the casting should seat. As the accuracy decreases, the fit of the casting becomes progressively worse. Measurement of this distance was made by use of a micrometer scale in the ocular of a microscope. The snugness with which the casting fits the master model is a critical factor in evaluating the results; uniformity of fit of the casting on the original model was maintained reasonably constant by compensating for wear by slight adjustments of the casting. Although the casting cannot fit the same after sliding on and off stone models several thousand times, values taken at extreme intervals are not compared directly.

The actual tightness of fit of the master casting plays a great part in determining the accuracy of the stone die. This is illustrated in Figure 1, which shows two different castings on the master steel die and these castings then placed, at a constant pressure, on the same stone die. Although the two castings appear to seat equally well on the steel die, one actually fits more snugly. As can be seen, only the looser fitting casting seats fully on the stone die. If the looser casting were to be used throughout an investigation designed as this one, the dimensional change would be observed less readily; thus the tightly fitting casting, which more clearly corresponds to the desired retention for such a restoration, was employed in this study. Its use permitted a more delicate measurement of minute dimensional changes in the stone die and thus in the impression.

It is important to point out that all the factors which are known to affect the accuracy or possibly the residual stress pattern, such as curing time before removal, type of band and the bonding of the material to the band, were controlled carefully. Thus, any resultant distortion could

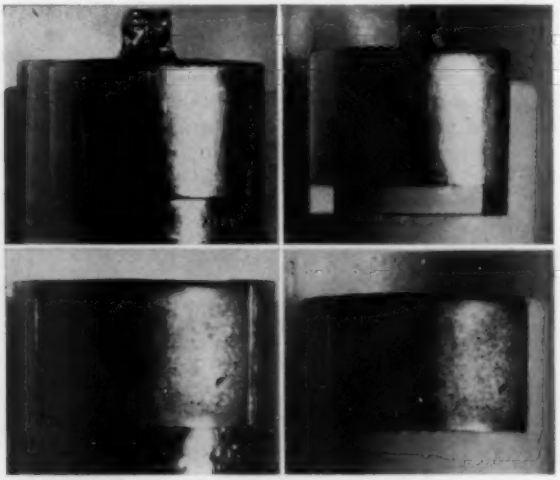

Fig. 1 • Left: Two castings apparently fit equally well on steel die. Right: When these castings are tried on same stone die, the more tightly fitting one (above, right) does not fully seat. The more critical casting was used in this investigation

not be attributed to improper manipulation of the impression material.

RESULTS

Thickness of Material • When a single mix was used, an increase in the thickness of the rubber base material resulted in reduced accuracy. Figure 2 shows the master casting seated on stone dies made from three different impressions, the same brand of material, poured immediately. The maximum material thickness, except the regions involving the proximal steps, was 0.5, 2.0 and 4.5 mm. The resulting discrepancy in the fit of the casting was 0.1 mm., 0.6 mm. and 1.8 mm., respectively. These are mean values and representative of all the brands tested. Likewise, when the single Dentoform tooth, which had severe undercuts on the surfaces not involved in the cavity preparation, was used, the band which permitted only a minimal material thickness also produced the most accurate results. (It must be remembered that these data apply to the single mix procedure. It will be pointed out subsequently that the thickness of material does not seriously influence accuracy with the double mix procedure.)

In Figure 3 can be seen a typical relationship between the thickness of material, storage time and storage medium. This graph has been adjusted for the discrepancy present at zero time, since this material, with the single mix technic, did not produce a "perfect" reproduction at zero time with any size of band. However, the discrepancies plotted are above this 0.2 mm. fiducial reading. It can be seen that increasing the thickness of material significantly increases the degree of distortion on storage.

Storage Mediums • Figure 3 would seem to indicate that the storage medium has no significant effect on distortion. The somewhat greater distortion in water with the 2 mm. thick specimens probably can be attributed to the acrylic top which was used on this band and was not employed with the 0.5 mm. series. Further study with plastic bands and trays indicated that they absorb water and distortion is increased. For example, when an impression taken in a plastic band was stored 24 hours in air, the casting failed to seat by approximately 1 mm.; however, when an impression was stored in water, the distortion was 3 mm. Thus, storage in water is certainly contraindicated with a plastic tray or band and seems to have no advantage with a metal retainer.

The data in Figure 4 show that all the materials investigated became distorted on standing. Since the single mix technic was used, the values have been adjusted for any inaccuracy at zero time. The amount of distortion varied somewhat for

Fig. 2 • Effect of thickness of material on accuracy. Control casting is shown on dies poured in impressions having thickness of 0.5 mm. (left), 2.0 mm. (center) and 4.5 mm. (right)

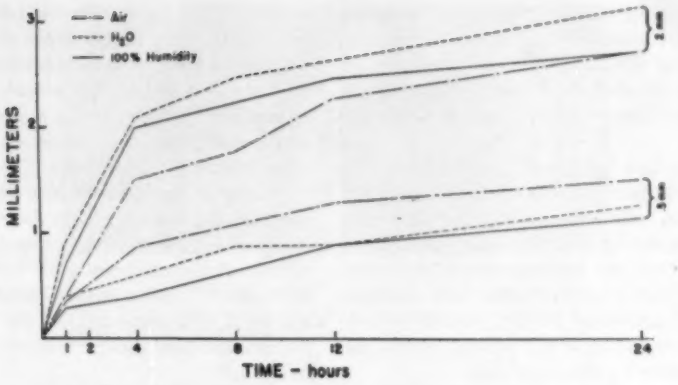

Fig. 3 • Effect of thickness of material and storage medium on distortion. Increasing thickness increases distortion on storage

each material, but the general pattern was comparable. Distortion occurs rather rapidly during the first few hours and probably can be associated with continued curing of the material during this interval. Studying stress-strain relationships, Miller and Dickson[3] noted accelerated changes during the first hour.

Distortion on standing was reduced somewhat when the double mix technic was employed, but was still of a most significant magnitude. One series of dies, with the master casting, can be seen in Figure 5. The distortion progressed at a fairly constant rate with the storage time.

Double Mix Technic • Use of a double mix method is advocated by some clinicians.[2] Superior results were obtained in this investigation by that method. The increased accuracy can be seen in Figure 6. These results are representative of all ma-

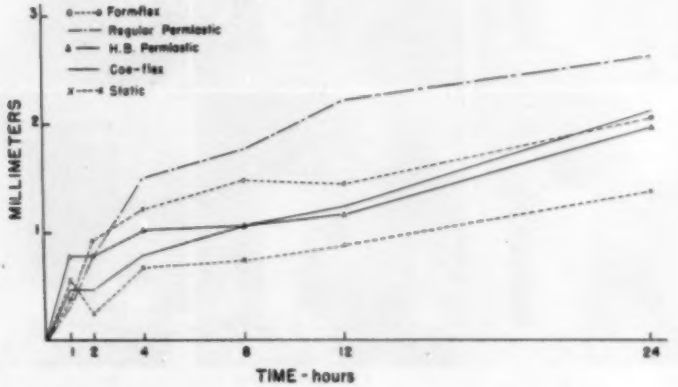

Fig. 4 • Distortion of various materials on storage in air. All show significant dimensional change

terials. Not only is the initial accuracy superior with the double mix technic but also the distortion during storage is reduced somewhat. A comparison of the data in Figures 4 and 7 demonstrates this fact.

The data in Figure 7 also indicate that pouring multiple dies from the same impression produces no greater distortion than merely storing the unpoured impression. The fact that successive dies show progressively greater distortion probably can be attributed to the effect of storage rather than the actual process of pouring and removing the stone dies.

When the initial mix was injected with a syringe rather than carried into the cavity preparation with an instrument, the danger of trapping air was greatly minimized. Perhaps even more important was the tendency to break up the air bubbles which often are incorporated unavoidably during mixing. When these bubbles are just below the surface of the impression, they will collapse during any storage and result in nodules on the surface of the stone die. An extreme example is seen in Figure 8. Certain materials were more susceptible to bubble entrapment than others.

Proper orientation of the tray in respect to the teeth seems to be equally as important as with the hydrocolloid impression.[9] When there is an uneven distribution of rubber base material around the tooth, distortion results (Fig. 9). This observation has also been made by Hollenback.[10]

The results discussed have been concerned entirely with the MOD steel die and the single Dentoform tooth. Even though undercuts outside of the actual preparation are lacking in the steel die, the long

10. Hollenback, George. Personal communication.

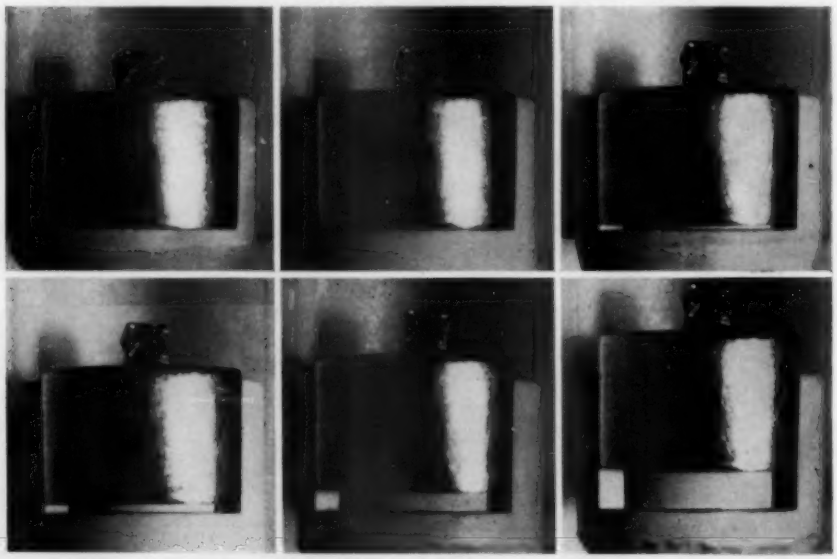

Fig. 5 • Fit of control casting placed on dies poured in impressions stored varying periods. Above left: Poured immediately. Above center: Poured at 1 hour. Above right: Poured at 2 hours. Below left: Poured at 4 hours. Below center: Poured at 24 hours. Below right: Poured at 4 days

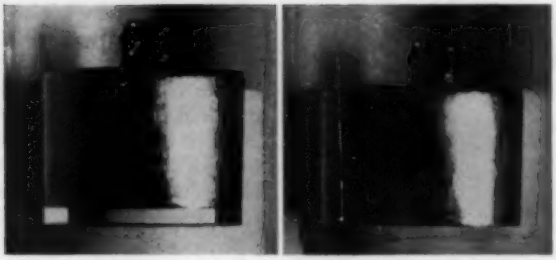

Fig. 6 • Left: Casting on die made from single mix impression. Right: Fit on die made from double mix impression. Increased accuracy with latter technic is obvious

parallel walls offer a more exacting test for the accuracy of an elastic impression material than the conventional dental cavity preparation. The data secured with the steel die, however, can be corroborated readily with results obtained on these more typical clinical type preparations. This is demonstrated in Figure 10, which shows a series of castings fabricated on the original model and placed back on stone dies poured at various time intervals. This model represents a series of preparations of varying types and difficulty of reproduction. The general increase in distortion on standing is apparent.

DISCUSSION

It has been shown that the rubber base impression materials shrink slightly during curing[8] and the reaction, which is responsible for the shrinkage, apparently continues for at least 24 hours and probably longer. Since the material is held by the adhesive to the tray or band, contraction would result in an oversize stone die. Any variable which would tend to produce an uneven curing of the material or a stress pattern would increase the danger of distortion. Thus factors such as nonuniformity of the mix, variation in the thickness of the material around the

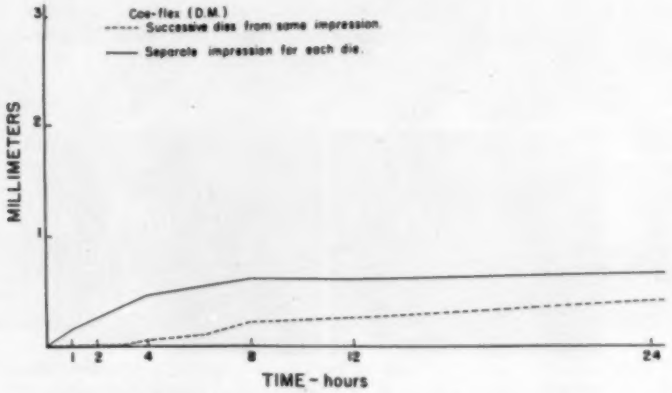

Fig. 7 • Distortion on storage of impression (double mix technic) and also by pouring multiple dies at various time intervals in same impression

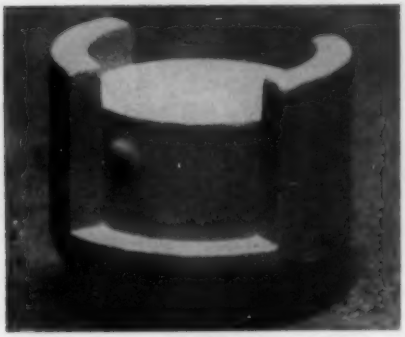

Fig. 8 • Nodule on stone die due to collapse of bubble in impression

preparation or excess bulk of material all accentuate the distortion on storage.

The superiority of the double mix technic over the single mix is probably due to several factors. When the partially set material in the band or tray is seated, it will displace much of the injected material. This tray material has undergone a greater amount of curing shrinkage and thus results in less subsequent change in the critical regions of the impression. Likewise, the tray material compresses the injected material and thus eliminates many of the air bubbles trapped within the material and between the material and the tooth. Certainly the use of a syringe for injecting the more fluid mix into the preparation aids greatly in the reduction of bubbles which in turn may slightly increase the original accuracy and reduce distortion on storage.

The results of this study clearly indicate that the impression should be poured as soon as possible. This statement is not in agreement with those of some investigators who suggest that the impression can be poured when convenient. In practice, the length of time that an impression can be stored before pouring would seem to depend on the degree of accuracy needed or desired. It is true that the magnitude of the distortion is dependent on the sensitivity of the measuring device and the configuration of the master model. A preparation such as the MOD steel die is a heroic test and when used in conjunction with a well-fitting casting makes possible the detection of distortion which would not be observed on many typical intraoral preparations. The effect of the fit of the casting was discussed earlier in this paper. It is apparent, however, that distortion occurs, and the accuracy possible and necessary for indirect work can be attained only by pouring the impression as soon as possible.

Although there are slight differences in the accuracy of various brands, the selection of a particular product probably should be based on handling characteristics such as ease of mixing and proportioning, setting time, flow and tackiness rather than the inherent accuracy.

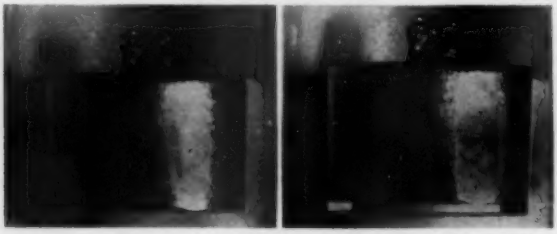

Fig. 9 • Left: Casting on die poured in impression properly centered to allow uniform bulk around preparation. Right: Inaccuracy resulted when impression was not centered and uneven distribution of rubber base material resulted

It was not the purpose of this investigation to compare the accuracy, or distortion on standing, with materials such as reversible or irreversible hydrocolloids. However, a series of impressions were taken with five widely-known hydrocolloids and measurements made. As a group, the five rubber base materials, when the double mix technic was used, showed less variation in results and less distortion on storage. The initial accuracy was comparable to that obtained with the two best reversible hydrocolloids.

CONCLUSIONS

Five brands of rubber base impression materials were studied to determine their dimensional stability on storage and the effect of certain other variables which influence their accuracy. Over 700 impressions were studied using a steel MOD die and a series of four multiple-cavity preparations.

1. None of the rubber base materials tested were dimensionally stable, and the distortion probably can be associated with continued curing of the material. Distortion, however, at any time interval was less than with reversible hydrocolloid.

2. Distortion was not significantly affected by the storage environment. Storage in water should not be employed when a plastic tray or shell is used.

3. Use of the double mix procedure not only increases the initial accuracy of the impression, but also reduces the distortion during storage.

4. When a band impression is taken with a single mix of material, accuracy decreases as the thickness of the surrounding rubber base is increased.

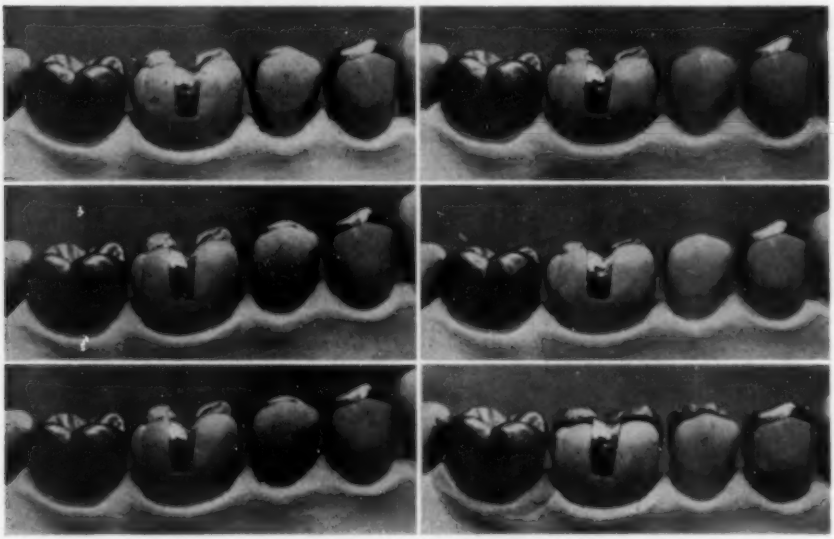

Fig. 10 • Distortion increases as impression is stored. Above left: Poured immediately. Center left: Stored 3 hours. Below left: Stored 6 hours. Above right: Stored 12 hours. Center right: Stored 24 hours. Below right: Stored 2.5 months. Dimensional change is not as evident as on critical steel die; however, careful examination of fit of full cast crown and MODBL inlay in particular shows visible distortion even at 3 or 6 hours

5. The bulk of the material is less critical when the double mix technic is employed.

6. Bubbles in the impression are minimized by the use of a syringe and double mix procedure.

7. Uneven distribution of impression material around the tooth increases distortion.

8. Successive dies may be poured in one impression with no greater distortion than storage of the unpoured impression for a comparable period.

9. When the brands tested were used properly, little difference was detected in their accuracy. Selection probably will be based on handling characteristics.

10. For indirect technics involving single or multiple preparations and short-span bridges, the rubber base impression materials are comparable in accuracy to the better reversible hydrocolloids. Long-span or complex bridges were not studied in this investigation, but no reason is known to contraindicate the use of this type of material in such instances.

Porcelain veneers fused to cast gold crowns

John F. Johnston, D.D.S.; R. W. Dykema,† D.D.S., and D. M. Cunningham,‡ D.D.S., Indianapolis*

For the past three years the crown and bridge and dental materials departments at Indiana University School of Dentistry have been conducting a research program on the use of a gold alloy, a solder, an opaque porcelain and a veneering porcelain with properties permitting them to be fabricated as a unit. The clinical and laboratory results at Indiana University have been compared with work done by several ceramic laboratories and by a number of men in practice. In this way it has been possible to observe and evaluate these materials and the diversified methods used in their application.[1]

There has been a gratifying improvement in color production and blending of porcelain to conform to the various individual shade guide units and to natural teeth. Surface texture and the illusion of "depth" in the body and simulated incisal translucency have been improved through the efforts and suggestions of many individuals. The manufacturer is hoping to be able to offer an incisal and blending porcelain powder having a greater degree of translucency.

All shades can be produced with the porcelain now in use. Incisal translucency and other effects can be obtained by staining, either on the opaque layer or on the porcelain veneer. However, success may be certain only after some intense practice by the operator, by tabulation of combinations and results, and by following a most exacting technic.

With these materials in their present

Paper presented before the Section on Partial Prosthodontics, ninety-seventh annual session, American Dental Association, Atlantic City, N. J., October 2, 1956.

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‡Assistant professor, crown and bridge department, Indiana University School of Dentistry.

1. Johnston, J. F.; Dykema, R. W., and Cunningham, D. M. Use and construction of gold crowns with a fused porcelain veneer—a progress report. J. Pros. Den. 6:811 Nov. 1956.

state of development, the novice or the slapdash technician will meet with many discouraging difficulties and failures. The experienced ceramist may have his troubles at first also, but he will possess the technical versatility to enable him to produce veneers acceptable to the patient and the dentist.

To match a shade guide in the laboratory is one thing; to match a shade guide so that, when the veneer is transferred to the mouth, it matches the natural teeth with the same degree of harmony, is another. Condensation of the porcelain, contour of the veneer, distribution of shades, method of firing, fusing cycle, the surface texture and "brilliance" of the porcelain veneer and the associated colors to be found in the environment all have a bearing on this harmony. Shading formulas for the veneering porcelain, with which research men at Indiana University have been working, have not been developed as yet to the point where this level of harmony can be attained easily and consistently by the majority of men who desire to use these materials. Progress, however, is being made in this phase also.

PREPARATION

The teeth to be restored with porcelain veneered crowns should be prepared in the same manner and to the same form as teeth which are to receive crowns veneered with resin[2] except that occlusal surfaces and incisal edges must be reduced more if these areas on the finished restorations are to be veneered. Shoulders at the mesiobuccal or mesiolabial line angles must be carried onto the mesial surfaces of cuspids and posterior teeth and onto both the mesial and distal surfaces of incisors. This will enable the veneer to hide all interproximal metal usually visible. The remainder of the cervical finishing line can be a chisel edge or a chamfer.

Surfaces which occlude must be reduced sufficiently to allow bulk of metal. Burnishing, through trauma, can induce form changes of such magnitude that veneers might check and chip. This has not occurred in any mouth under our observation, but it has been reported to us on two occasions. Although such a phenomenon will be produced very slowly, the possibility that it can occur seems logical.

THE CASTING

The castings which were made from the gold alloy have retained their luster in the mouth and have exhibited no more changes due to occlusion than would be expected with other alloys with similar physical properties used in the construction of crowns and bridges.

The alloy can be cast to any desired frictional fit and to any form of marginal sharpness. If the laboratory routines using standard gold alloys have produced good castings which have fit according to a predetermined plan, then without changing those routines the same results can be obtained using this alloy.[1]

The casting, to which the veneer is bonded, closely resembles in form those designed for plastic veneers when the latter are retained by wire loops. Undercuts and retentive boxes have been used in a very few instances and as yet there is no evidence to support using such retention in the surface of the casting. The porcelain should be applied to an area at right angles, or nearly so, to the outside contour of the crown or pontic.

The incisal edges of anterior castings can be blunt and short of the desired length, resulting in an unsupported veneer in that region. Occlusal surfaces or parts of occlusal surfaces of posterior castings may be reduced to receive veneers. This depends on the possibility of reducing the tooth or gold structure

2. Starr, F. C. Acrylic in jacket crowns and bridge pontics. J. Pros. Den. 2:543 July 1952.

of the pontic sufficiently to allow the necessary 1.25 mm. thickness in the veneer. (The 1.25 mm. is an emperical figure but it has been workable to date.)

TECHNIC

The technic advocated by the manufacturer is as follows:

The casting is pickled. All surfaces of the casting except the one to be veneered are polished. The surface to be veneered is cleaned with a bur for this purpose. The opaque porcelain is applied in a creamy mixture with distilled water, is dried and is placed in a furnace whose temperature is below 1100° F. The temperature is brought to 1450° F. at a rate of 100° per minute. The opaque material is checked for thin spots and corrected by addition if and where necessary.

The porcelain powder is added in the desired shade pattern. The veneer is overcontoured, vibrated and dried to maximum density. It is placed in an 1100° furnace, and the temperature is brought to 1600° F. at a rate of 100° per minute. The margins are trimmed. Porcelain powder is added to contour and the porcelain is condensed. It is placed in an 1100° furnace and the temperature is brought to 1650° F. at a rate of 100° per minute. The temperature is maintained for one or two minutes, depending on the type of surface desired.

The overglaze, if needed, is applied in a very thin coat and the temperature is brought to 1600° F. The temperature is not held. The procedure is repeated.

CONTROL OF STAIN IN BONDING

There are several ways to avoid or eliminate the so-called "green line." First the preparation should be made so that the shoulder extends into the interproximal spaces and into the gingival crevice. In this way the joint will not be visible.

The green line, which sometimes is apparent at the junction of the porcelain veneer and gold when Ney-Oro porcelain is fired to Ney-Oro P-9 gold, is caused by having the porcelain veneer in direct contact with the gold in this region, with no opaque material between. This contact can be caused by allowing a small amount of porcelain to overlap the metal at the joint; through failure to have the surfaces to be veneered completely covered by an opaque layer before firing; by the opaque material shrinking away from the metal at the border during the first firing, or by the porcelain veneer shrinking in the wrong direction during firing, pulling the opaque material with it.

The shrinking of the opaque porcelain can be prevented by applying a uniform thickness of the opaque material, drying it by blotting with gauze or a towel, and then applying a bead of the opaque material with the side of a small brush at the outline of the area to be veneered.[3-5] The opaque porcelain thus applied will not shrink away from the margin, since shrinkage is in the direction of the greatest mass. This makes it mandatory for most operators that the opaque layer be stained to match the porcelain veneer. Otherwise there will be a white line at the junction of the gold and the veneer.

CONTROL OF FORM

Shrinkage of the porcelain can be controlled by correctly building up the porcelain itself prior to firing. Adequate condensation is important, of course, but of greater importance is the overcontouring to compensate for shrinkage during firing. The veneer should be overcontoured slightly first, but with relatively normal anatomical form, using any accepted method of condensation. Then the regions near the junction of the porcelain and metal should be overcontoured ex-

3. Jones, Russell. Personal communication.
4. Dunton, Harry. Personal communication.
5. Kramer, Otto. Personal communication.

cessively by the addition of porcelain to those regions.

At this point during condensation violent vibration should be avoided since it would tend to alter the form. The porcelain should lap the gold slightly at the margins. Applied in this way the porcelain will not tend to shrink from the margins and the usual type of crown with the buccal or labial surface can be constructed with only one bake necessary to obtain form.

If the tooth being restored is not to be used as an abutment tooth and thus does not require surveyed contour for clasping, better body structure and surface texture will be obtained if the first application of porcelain is overcontoured and beaded at the junction of the veneer and the casting. This bead extends laterally beyond the contour of the crown but need not always contact the metal.

This application should be fired to a high biscuit and cooled. The surface is contoured with stones and disks, any existing marginal discrepancies are filled in and the veneer is fired again to the desired surface texture.

When two or more units of a bridge require veneering, just before drying it is necessary to separate the condensed porcelain with a metal strip or thin lancet; otherwise the units will appear to have run together. Even then, separation of units frequently must be simulated by staining. This added coloring need not be defined sharply but may be suggested by what appears to be a shadow of gray, blue or even brownish-black.

OVERGLAZE

Correct contour for lateral and protrusive excursions as well as for closed relationship can be ground into overcontoured occlusal surfaces. After such grinding it is better to use an overglaze[1] rather than to bring about a desirable surface texture by straight firing.

It will be argued by some that the overglaze will wear off. On all surfaces of the crown or veneer, except the occlusal, such an assertion is debatable if the glaze has been fired meticulously.[6] On the occlusal surface this can be ignored because of the periodic equilibration which is necessary if eventual trauma is to be avoided. The markings on the occlusal surface should be outlined by staining the biscuit surface. Here, again, thorough condensation of the porcelain is desirable.

The ridge lap section of pontics can be veneered. The easiest and quickest method is to overcontour the region and grind to form and adaptation and produce the required surface with an overglaze.

Unsupported incisal edges can be formed to occlude and incise if the tooth is prepared so that space is provided for at least 1.25 mm. of porcelain over the casting. They should be formed, condensed and glazed by following the same routine used for occlusal surfaces.

EXPERIMENTS

With the exception of three lower cuspid crowns[1] on which the veneers chipped at the incisal surface because, after equilibration, they were too thin, our only difficulty in bonding has been on the flat tissue-side surfaces of two lower posterior pontics. Here, during construction, some veneers "popped off" when fused to a medium biscuit bake.[1] In the laboratory it has not been possible to cause this to happen routinely.[7] Why it happened is not known. To our knowledge this has not occurred when such a region has been irregular in form.

Experiments have been started to determine clinically the minimal area of bonding surface necessary, that is, to what extent the labial surface of the casting

6. Phillips, R. W., and Swartz, M. Personal communication.
7. Wain, Roy. Personal communication.

can be cut away and still maintain the stability of the casting, the adhesive quality of the veneer and sufficient strength in the veneer for the uses to which it would be subjected.

PORCELAIN SHOULDERS

Shoulders on the casting may vary in width, but 1 mm. is considered as the standard. Although the metal can be thin in these regions, it should not be feathered unduly toward the margin if this will make it necessary to build the veneer to a thin or knife edge. Frequently, the appearance can be improved if the gold collar is not present at the labiocervical aspect.

Many technicians and dentists swage the platinum on the surface of the die to be exposed; then they wax the crown and cast to the platinum. Some expose a portion of the labial surface; others, just the shoulder.[4,5]

The opaque porcelain is applied to the casting and fired as directed. When the casting then is returned to the die, the first layer of porcelain veneer is added, that portion at the shoulder being treated in the same manner as when a jacket crown is built over a platinum matrix. The porcelain is beveled at the shoulder and then built to contour during subsequent applications.

The remainder of the technic is the same as just described.

One investigator maintains that when the porcelains used for veneering purposes, regardless of manufacturer or system, are fused they are too brittle to allow any great segment of the labial veneer to be unsupported.

The labial portions of the veneers are thin and they may be subjected to unusual strain patterns when shrinking if bonded on three sides to a metal frame. However, even though unsupported incisal edges have greater bulk and have the support of the metal to which they are bonded, they receive far greater forces than labial regions, once the unit has been cemented, and so far such incisal edges have been satisfactory. When a portion of the labial veneer is without a gold backing, the choice of the cementing medium becomes more critical from a shade standpoint.

LIMITATIONS

There are problems in matching shades except in the hands of the very skillful ceramist, and there are unpredictable variations in shades even when the same combinations and proportions of materials are used. That these problems can be solved has been demonstrated by a number of people, but for a method or a material to be practical, universally accepted and favored, these eccentricities must be reduced.

Powder combinations which are advocated for air firing are not suitable if a vacuum furnace is being used. Vacuum firing produces a darker shade than regular fusing.[4,5] Although it may not be worthwhile in the future, at the present time it is well if each ceramist develops his own shade guide,[3,4,7] using the same equipment with which his restorations will be fired. This guide must include specimens of the basic colors and of powder combinations which will provide the lighter numbers on the more widely used shade guides. Producing the darker shades is not so difficult.

VARIATIONS IN TECHNIC

Three ceramic laboratories using those methods with which research workers at Indiana University are familiar are producing outstanding restorations, both as to shade and texture. Two of them use vacuum firing; the other uses a regular S. S. White furnace. Each stains the opaque material with S. S. White stain which fuses at 1600° F., but their staining technics differ slightly. One raises the temperature to 1450° only; the second,

to 1525°, and the third, to 1585° F. Each places the dried opaque material in the furnace at a temperature below 1200°. The first raises the temperature to 1450° at whatever speed his furnace will heat. The second advances his temperature at 100° per minute. The third one increases the temperature at 50° per minute.

Veneers are fired by one laboratory at 1550°; by the other two at 1585°. Just how and by what standards these furnaces are calibrated, we do not know. Each holds the furnace at the designated temperature from one to three minutes. Each uses an overglaze only when making corrections in the shade by using stains.

It is the considered opinion of these men that because of the lack of translucency, the shades are critical and require time, practice and experience for satisfactory color matching. However, each agrees with us that it can be done. Such problems always have been present with any low-fusing porcelain.

They believe that the low-fusing porcelain reflects light; that it does not absorb light and blend with its surroundings in the same way as a high-fusing translucent porcelain. This characteristic is what makes shading difficult for the inexperienced technician or dentist. They recommend some practice before attempting the construction of a veneered crown and suggest that the first restorations be for cuspids or posterior teeth. We at Indiana University and the manufacturer make the same recommendation.

These ceramists state that the alloy makes castings which fit and that the bonding of the veneer to this alloy is very satisfactory.

SUMMARY AND CONCLUSIONS

The use of a gold alloy, a solder, an opaque porcelain and a veneer porcelain fabricated as a unit has been studied and the following conclusions have been reached:

1. The use of these materials is indicated in any part of the mouth when the skill of those concerned with the construction of the replacement is sufficient to produce a veneer compatible with and in harmony with its surroundings. Such skills can be developed with some effort, but the amount of effort necessary should lessen rapidly during the next two or three years.

2. The alloy satisfactorily meets casting and construction requirements.

3. Some dentists and technicians feel that the opaque porcelain might be manufactured in three or four basic shades to be used with two powders. One powder would soften and one would intensify those shades. The same results can be obtained, however, by adding stains to the opaque material, but if the complexities of the technic are reduced, more people might use the method.

4. The porcelain veneer must be blended for the desired shades, but, again, a number of people feel that a much wider use could be expected if the shades were premixed and if powders were available to decrease and increase the shade values. Although at present skill must be developed in blending, it has been shown that premixed shades do not consistently match shade guides any better than furnished formulas. Initial efforts should be on posterior teeth.

Although improvements are imperative, it must not be overlooked that this advance in clinical dentistry is one of the most valuable and interesting in recent years. For several purposes it already has become indispensable.

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Comparative effects of local and systemic antibiotic therapy in the prevention of postextraction bacteremia

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Dentists and physicians have endeavored for years to devise some effective measure for prevention of postextraction bacteremia, especially since it was demonstrated[1-3] that organisms invade the blood stream with greater facility than had been previously realized.

Tooth extraction ruptures capillaries in the gingival sulcus. Through these ruptured blood vessels, the normal bacterial inhabitants of the mouth enter the blood stream. The greater the trauma, the greater the chances of bacterial entry. It is significant that *Streptococcus viridans*, the commonest organism in the mouth, is engrafted on the heart valves in 85 per cent of patients with subacute bacterial endocarditis.

Extraction of teeth is hazardous for patients whose heart valves are congenitally deformed or damaged by disease. Cates and co-workers[4] have shown that about 50 per cent of all instances of subacute bacterial endocarditis follow dental manipulation in patients with a history of rheumatic heart disease.

If tooth extraction cannot be avoided, what should be done to protect the patient with damaged valves? Attempts have been made to prevent bacteremia by administering sulfonamides or penicillin preoperatively. The results have left much to be desired despite the reported success by some investigators.

Some workers reported success with penicillin[5] and chlortetracycline[6] on the basis of negative blood cultures, but they had failed to add inactivators to the culture media. The residual antibiotic or antibacterial agent in the blood sample continues to act on bacteria in the culture flask, and unless the effect is neutralized by an inactivator, false negative cultures are obtained. In studies where penicillinase was added to inactivate the penicillin, the antibiotic proved to be of only limited value in preventing postextraction bacteremia.[7-9]

From the research laboratories of the Albert Einstein Medical Center, Northern Division, Philadelphia. Study aided by a grant from Wyeth Laboratories, Inc.

1. Okell, C. C., and Elliott, S. D. Bacteremia and oral sepsis, with special reference to etiology of subacute endocarditis. Lancet, 2:869 Oct. 19, 1935.

2. Pressman, R. S., and Bender, I. B. Effect of sulfonamide compounds on transient bacteremia following extraction of teeth; sulfanilamide. Arch. Int. Med. 74:346 Nov. 1944.

3. Robinson, L., and others. Bacteremias of dental origin. II. A study of the factors influencing occurrence and detection. Oral Surg., Oral Med., and Oral Path. 3:923 July 1950.

4. Cates, J. E., and Christie, R. V. Subacute bacterial endocarditis. Quart. J. Med. 20:93 April 1951.

5. Fanning, R. J. Effect of penicillin upon bacteremia following tooth extraction. Hawaii M. J. 10:432 July and Aug. 1951.

6. Roth, O., and others. Aureomycin in prevention of bacteremia following tooth extraction. Arch. Int. Med. 86:498 Oct. 1950.

7. Rhoades, P. S.; Schram, W. F., and Adair, D. Bacteremia following tooth extraction: prevention with penicillin and N U 445. J.A.D.A. 41:55 July 1950.

8. Merril, A., and others. Penicillin in the prevention of postextraction bacteremia. J.A.D.A. 42:395 April 1951.

9. Glaser, R. J., and others. Effect of penicillin on bacteremia following dental extraction. Am. J. Med. 4:55 Jan. 1948.

Erroneous results also may be obtained if no consideration is given to the degree of trauma during extraction. It is important to evaluate the degree of trauma sustained by each patient and to calculate results for mild and heavy trauma separately. An investigation[10] has shown that 400,000 units of penicillin administered intramuscularly had little effect on postextraction bacteremia if trauma was heavy but if the trauma was mild it was extremely effective. Similar observations were made by Rhoades, Schram and Adair,[7] and Merril, Vivino, Dowling and Hirsh.[8]

Disappointing results with antibiotics can be explained in several ways:

1. Penicillin itself cannot suppress all the organisms found in the mouth, and therefore is not likely to be effective against those same organisms when they have reached the blood stream. However, combinations of antibiotics broaden the antibacterial spectrum. The combined use of penicillin and streptomycin has been advocated by the authors.[11] Northrop[12] also made the same recommendation but with no supporting experimental evidence.

2. The interval between administration of the drug and extraction of the teeth recommended by many investigators is too long. If 400,000 units of fortified penicillin is administered intramuscularly, the optimum concentration of the antibiotic will be present in the blood stream and saliva within one hour.[13] The American Heart Association[14] has recommended the use of 1,200,000 units of penicillin given parenterally one-half hour before extraction, admittedly on an empirical basis.

3. In all previous attempts to prevent postextraction bacteremia, antibacterial agents were introduced parenterally as a means of attacking the organisms after they had entered the blood stream. No attempt was made to eliminate the organisms at their source, in the gingival sulcus, by local antibiotic treatment.

The present investigation was carried out with a series of experimental studies which *in toto* lead to the conclusion that postextraction bacteremia can be prevented most effectively by using a combination of antibiotics, given both parenterally and locally, in the form of oral troches, before extraction.

The general plan of this study series was to administer various antibiotics, singly or in combination, to patients about to have teeth extracted. Administration was by intramuscular or intravenous injection, troche, or both. Effectiveness of therapy was measured by means of blood cultures, taking into consideration the degree of trauma incurred during extraction and the incidence of postextraction bacteremia in untreated or control groups.

The plan also included a search for conditions favorable to prevention. This required various auxiliary studies such as bacterial population counts in the saliva, isolation and identification of organisms in the blood together with frequency counts, *in vitro* sensitivity tests of the isolated organisms to the various antibiotics, and assays of antibiotic levels in saliva and blood serum. A number of studies were conducted on inactivation of antibiotics in culture media so that validity of results obtained by culturing could be assessed.

CLINICAL MATERIAL

Three hundred and fifty-seven patients, ranging in age from 16 to 90, were taken

10. Bender, I. B., and Pressman, R. S. Antibiotic treatment of the gingival sulcus in the prevention of postextraction bacteremia. J. Oral Surg. 14:20 Jan. 1956.

11. Pressman, R. S., and Bender, I. B. Dental extractions and their relationship to subacute bacterial endocarditis. J. Albert Einstein Med. Center 94:99 Feb. 1953.

12. Northrop, P. M. Preoperative management of the oral surgery patient. J. Oral Surg. 11:105 April 1953.

13. Bender, I. B.; Pressman, R. S., and Tashman, S. G. Studies on excretion of antibiotics in human saliva. I. Penicillin and streptomycin. J.A.D.A. 46:164 Feb. 1953.

14. American Heart Association. Prevention of rheumatic fever and bacterial endocarditis through control of streptococcal infections. Circulation 11:317 Feb. 1955.

at random from the wards and dental outpatient clinics of the Albert Einstein Medical Center (Northern Division) and the Philadelphia General Hospital. The only criteria for selection were (1) the patient must require extraction of at least two teeth and (2) he must not have received antibiotics or sulfonamides within the preceding ten days.

Patients were divided into nine groups; a control group of 93 patients, and eight experimental groups ranging in size from 30 to 37 patients. The size of the experimental groups was determined by the need to conserve clinical material, and justified by analysis of control group results. The 93 control patients were studied in three subgroups. Although each subgroup was studied in a different year (1942, 1950, 1954) results for any one subgroup of 30 or so patients were similar to results for the entire 93 patients.

PROCEDURES

In all experimental groups, saliva samples were taken before and after administration of antibiotics; blood samples were taken before administration of antibiotics, immediately after extraction of teeth, and ten minutes after extraction of teeth. Procedures in the control group were similar except that antibiotics were not administered.

Therapy for Each Group • Individuals in all groups were treated alike except for the kind of antibiotic used, and the mode of administration.

Group 1 (93 patients): Control. No antibiotics administered. The patients in this group were studied concurrently with those in the various experimental groups.

Group 2 (32 patients): Penicillin. Single intramuscular injection one hour before tooth extraction, of 400,000 units of fortified penicillin (100,000 units crystalline potassium penicillin with 300,000 units procaine penicillin).

Group 3 (30 patients): Streptomycin. Single intramuscular injection, one hour before extraction, of 1 Gm. of streptomycin sulfate.

Group 4 (34 patients): Penicillin-streptomycin. Single intramuscular injection, one hour before extraction, of a mixture of 400,000 units of fortified penicillin (see Group 2) and 1 Gm. of dihydrostreptomycin.

Group 5 (32 patients): Chloramphenicol. Single intravenous[15] injection of 1 Gm. of chloramphenicol, one-half hour before extraction.

Group 6 (37 patients): Troche A. One troche (penicillin 20,000 units, bacitracin 50 units, sulfadiazine 0.13 Gm. and benzocaine) taken one-half hour before extraction and held in the mouth until completely dissolved (20 to 30 minutes).[16]

Group 7 (30 patients): Troche B. One troche (neomycin 5 mg., bacitracin 200 units, polymyxin 200 units) taken one-half hour before extraction and held in the mouth until completely dissolved.[17]

Group 8 (35 patients): Parenteral antibiotic-troche A. Single intramuscular injection, one hour before extraction, of penicillin-streptomycin mixture (see Group 4); plus one troche A (see Group 6) taken one-half hour before extraction and held in the mouth until completely dissolved.

Group 9 (34 patients): Parenteral antibiotic-troche B. Single intramuscular injection, one hour before extraction, of Bicillimycin (dibenzylethylenediamine dipenicillin G, 600,000 units; potassium penicillin G, 300,000 units; procaine penicillin, 300,000 units; dihydrostreptomy-

15. Bender, I. B.; Pressman, R. S., and Tashman, S. G. Studies on excretion of antibiotics in human saliva. II. Chloramphenicol. J. D. Res. 32:287 April 1953.

16. "Sul-pondet." Trade name, Wyeth Laboratories, Inc.

17. "Wybiotics." Trade name, Wyeth Laboratories, Inc.

cin sulfate, 250 mg., and streptomycin sulfate with sodium citrate, 250 mg.); plus one troche B (see Group 7) taken one-half hour before extraction and held in the mouth until completely dissolved.

Saliva Samples • The patients chewed a one-half inch sterile block of paraffin to induce salivation. A 5 ml. sample of saliva was collected in a sterile sputum bottle before administration of the antibiotic, and another 5 ml. sample was collected after administration. The specimens were frozen immediately by means of solid carbon dioxide and 95 per cent ethyl alcohol and stored at minus 20° C. until the following day. Bacterial counts and antibiotic assays were made by methods previously described.[18]

Blood Samples • Blood samples were taken before administration of the antibiotic, immediately after tooth extraction, and ten minutes after extraction.

Sixteen milliliters of blood was withdrawn from the median basilic vein, using a 20 ml. syringe and a 20 gauge needle, and divided into four parts for culture as follows:

1. For aerobic study, two samples of 4 ml. were inoculated in duplicate into two McCartney flasks (with rubber diaphragm) containing 20 ml. brain heart infusion (Difco) fortified with 0.033 per cent sodium polyanetholsulfonate (Liquoid).[19, 20] Penicillinase (Difco Bacto-Penase) 0.2 to 0.3 ml. was added to each flask. This amount will inactivate over 10,000 units of penicillin. Penicillinase and paraaminobenzoic acid were added whenever penicillin or sulfonamides were used.

2. For anaerobic study, two samples of 4 ml. were inoculated in duplicate into two 25 ml. test tubes (screw-capped with rubber diaphragm) containing 20 ml. thioglycollate medium. Polyanetholsulfonate and penicillinase were added in the same amount as used in the aerobic cultures.

An extra 5 ml. of blood was withdrawn when the second or third blood sample was taken and used for assay of antibiotic levels in the blood serum. The assay method has been previously described.[12]

Anesthetic • Patients were anesthetized with 2.5 ml. of 2 per cent procaine solution containing epinephrine 1:50,000. Epinephrine does not interfere with the dispersal of organisms into the blood stream. This was demonstrated by withholding epinephrine from the anesthetic given to 30 of the 93 control patients; the incidence of bacteremia in the two groups was approximately the same.[11]

Extraction • All teeth were extracted by the usual method, with the use of elevators and forceps. The field was not sterilized, and the region of extraction was not isolated with cotton rolls. The number of teeth extracted ranged from 2 to 10 per patient, the average being four for the control patients, and 4.8 for patients in the experimental groups. Before extraction, the number of missing teeth and any evidence of periodontal disease was noted. There was no apparent correlation between the clinical periodontal condition and the bacterial content of the saliva. The degree of trauma in extraction was evaluated and recorded as trauma 1 (mild) or trauma 2 (heavy).

RESULTS

Table 1 shows the number and percentage of positive blood cultures obtained

18. Bender, I. B.; Pressman, R. S., and Tashman, S. G. Effect of parenteral administration of antibiotics on bacterial population of the mouth. J. D. Res. 32:78 Feb. 1953.

19. Massa, M., and Battistini, G. Einfaches und erfolgreiches Verfahren zur Blutzuchtung und direkter bakterioskopischer Nachweis im Blut. Zentralbl. f. Bakt. (Abt. I) 131:241 April 5, 1934.

20. von Heebler, T., and Miles, A. A. Action of sodium polyanethol sulphonate ("Liquoid") on blood cultures. J. Path. & Bact. 46:245 March 1938.

Table 1 • Comparative effects of antibiotic preparations on postextraction bacteremias

Study	Immediately after extraction			Ten minutes after extraction		
	No. of cases	No. of positive cultures	% of pos. cult.	No. of cases	No. of positive cultures	% of pos. cult.
1. Controls	93	79	84.9	93	41	44.1
2. Penicillin	32	17	53.1*	30	8	26.7*
3. Streptomycin	30	17	56.6	30	7	23.3
4. Penicillin & streptomycin	34	9	26.4	34	4	11.7
5. Chloramphenicol	32	7	21.8	32	4	12.5
6. Troche A	37	15	40.5	37	3	8.1
7. Troche B	30	16	53.0	29	4	13.8
8. Penicillin, streptomycin & troche A	35	6	17.1	35	2	5.7
9. Penicillin, streptomycin & troche B	34	9	23.5	34	3	8.8

*Another series of cultures, without use of penicillinase as inactivator, gave for the 32 patients: 6.2 per cent instead of 53.1 per cent; 0.0 per cent instead of 26.7 per cent.

from the patients in each group immediately after extraction and ten minutes after extraction.

Table 2 displays the same data, but applies them separately to patients who sustained mild trauma (trauma 1) and heavy trauma (trauma 2).

Table 3 gives the bacterial counts in the saliva before and after administration of the various antibiotics and antibiotic combinations. The corresponding average antibiotic levels in saliva and in blood serum are also shown.

Table 4 lists the organisms recovered, exhibiting how many times each was found in the blood samples from patients of each group.

Table 5 reports the sensitivity of organisms isolated from the blood stream to the *in vitro* action of the various antibiotics.

Figures 1 through 3 report results of studies on the rate of destruction of antibiotics in culture media; dihydrostreptomycin sulfate in brain heart infusion broth (Fig. 1) and in thioglycollate broth (Fig. 2); chloramphenicol in brain heart infusion broth and in thioglycollate broth (Fig. 3).

Group 1—Control • Before extraction only one of the blood samples of 93 control patients yielded a positive culture. The organism recovered was *Staphylococcus albus nonhemolyticus.* Immediately after teeth were extracted, 84.9 per cent of the patients had developed bacteremia as indicated by positive blood cultures. Ten minutes later, the percentage of positive blood cultures had fallen to 44.1 per cent.

The incidence of bacteremia was less for those patients who had sustained only mild trauma (68.7 per cent positive instances, dropping after ten minutes to 34.3 per cent) than for those who had heavy trauma (93.4 per cent, dropping to 49.7 per cent).

The organisms found in the ten minute sample were, in all instances except one, the same as those in the immediate sample. They were likewise the same organisms which were found in greatest numbers in the saliva samples. Streptococci, the commonest inhabitants of the mouth, were recovered in the blood more often than any other organisms.

Group 2—Penicillin • Bacteremia developed in 53.1 per cent of the penicillin-treated patients immediately after tooth extraction, and fell to 26.7 per cent after ten minutes.

For patients with mild trauma the bac-

teremia was 16.6 per cent falling to zero per cent after ten minutes; with heavy trauma, 75.0 per cent falling to 40.0 per cent after ten minutes.

To understand the significance of these figures, it is necessary to remember that in the control group, without benefit of antibiotic, bacteremia fell about 50 per cent in ten minutes. In other words, blood has a natural antibacterial activity. The antibiotic in the blood during the ten minutes after extraction can be given credit only for that reduction in bacteremia which exceeds 50 per cent of the drop in the immediate blood culture samples.

The fact that 53.1 per cent of all the patients in the penicillin group developed bacteremia immediately after extraction, as compared with 84.9 per cent in the control group, is statistically significant. The fact that ten minutes later only 26.7 per cent of the penicillin-treated patients had bacteremia is not significant, as it is only a 50 per cent drop. The figures for patients with heavy trauma are not significant, either immediately or ten minutes after extraction.

Bacterial sensitivity tests, using the disk method, showed that 0.08 to 7.3 units per milliliter of penicillin were required to exhibit sensitivity of the organisms; only one organism displayed resistance. Assays showed that the amount of penicillin excreted into the saliva—0.006 to 0.022 units per milliliter—was below the lethal concentration. This may explain why the bacterial population count in the mouth did not fall by a significant amount.

There was no correlation between penicillin levels in the saliva and in the

Table 2 • Degree of trauma versus effectiveness of antibiotics against bacteremia

Treatment	Type of trauma	Total cases	Immed. after extraction			10 min. after extraction		
			No. pos.	% pos.	p*	No. pos.	% pos.	p*
1. Control	1	32	22	68.7	—	11	34.3	—
	2	61	57	93.4	—	30	49.2	—
2. Penicillin	1	12	2	16.6	0.006	0	0.0	0.05
	2	20	15	75.0	0.06	8	40.0	0.62
3. Streptomycin	1	18	8	44.4	0.15	3	16.6	0.13
	2	12	9	75.0	0.16	4	33.3	0.45
4. Penicillin & streptomycin	1	7	1	14.2	0.02	1	14.2	0.60
	2	27	8	29.6	0.001	3	11.1	0.002
5. Chloramphenicol	1	12	1	8.3	0.001	1	8.3	0.18
	2	20	6	30.0	0.001	3	15.0	0.02
6. Troche A	1	13	0	0.0	0.001	0	0.0	0.04
	2	24	15	62.5	0.001	3	12.5	0.004
7. Troche B	1	19	9	47.4	0.22	2†	11.1	0.19
	2	11	7	63.6	0.02	2‡	20.0	0.05
8. Penicillin & streptomycin plus troche A	1	14	3	21.4	0.008	0	0.0	0.03
	2	21	3	14.3	0.001	2	9.5	0.003
9. Penicillin & streptomycin plus troche B	1	22	6	27.2	0.007	2	9.0	0.001
	2	12	3	25.0	0.001	1	8.3	0.02

*Probability (0.05 or less indicates significant difference due to treatment).
†Based on 18 cases.
‡Based on 10 cases.

Table 3 • Effects of antibiotic preparations on bacterial population counts in the mouth

Study	No. of cases	Average number of bacteria (in millions per ml. of saliva)		Average concentration of antibiotic	
		Before & after antibiotic administration		Saliva	Blood serum
				per milliliter	
2. Penicillin	25	42.3	41.8	0.01 u.	2.74 u.
3. Streptomycin	29	35.0	31.4	2.65 μg.	26.2 μg.
4. Penicillin & streptomycin				0.029 u.	2.84 u.
	41	37.0	13.2	2.89 μg.	19.3 μg.
5. Chloramphenicol	20	42.0	25.5	1.8 μg.	13.5 μg.
6. Troche A	33	31.7	4.3	20 mm.*	0.0
7. Troche B	15	36.2	0.197	10 mm.*	0.0
8. Penicillin, streptomycin & troche A					2.67 u.
	31	24.3	1.4	30 mm.*	23.8 μg.
					3.0 u.
9. Penicillin, streptomycin & troche B	18	46.7	0.134	12 mm.*	25.7 μg.

*Antibiotic activity of saliva specimen measured as zones of inhibition in millimeters at the end of one hour: Staphylococcus aureus 209 was the test organism used.

blood serum of the same patient. Blood serum penicillin levels ranged from 0.8 to 4.8 units per milliliter. This indicates that most patients had enough penicillin in the blood to destroy the penicillin sensitive organisms.

Group 3—Streptomycin • Bacteremia in the streptomycin group was 56.6 per cent immediately after extraction; 23.3 per cent ten minutes after extraction. As in the penicillin group, over-all results immediately after extraction were statistically significant, but the further reduction ten minutes later could be accounted for by the natural antibacterial activity of the blood. Patients with heavy trauma were not significantly helped either immediately or ten minutes after extraction.

Tests showed that the recovered organ-

Table 4 • Number of times organism recovered in blood immediately after extraction

Organism	Group number								
	1	2	3	4	5	6	7	8	9
Str. viridans (group)	52	10	11	4	2	5	8	3	5
Str. anhemolyticus	19	2	5	7	3	3	5	3	1
Str. B. hemolyticus	—	1	1	—	—	—	1	—	1
Staph. albus nonhemolyticus	12	1	—	1	3	1	—	1	—
Staph. albus hemolyticus coagulase negative	2	1	—	1	—	3	—	1	—
Diplococcus pneumoniae	8	2	—	1	—	1	—	—	—
Diphtheroids	15	7	7	—	1	5	3	1	1
Neisseria flava	—	4	—	—	—	—	—	—	—
Neisseria catarrhalis	—	—	1	—	—	1	2	—	—
Flavobacterium	8	—	—	—	—	—	—	—	—
Micrococcus tetragenus	—	—	—	—	—	—	1	—	—
Number of cases	93	32	30	34	32	37	30	35	34

All instances were negative preoperatively with the exception of: 1 case in control Group 1; 1 case in Group 4; 2 cases in Group 8.

In all four instances the organism recovered was Staph. albus nonhemolyticus. These may be considered as contaminants.

Cultures were seldom positive under anaerobic conditions when negative under aerobic conditions.

Table 5 • Sensitivity of organisms isolated from the blood stream

	No. of tests	No. of resistant organisms	Range of sensitivity
Penicillin	144	1	0.08 to 7.3 u.
Streptomycin	147	16	4 to 15 μg.
Chloramphenicol	140	5	0.6 to 9.3 μg.
Chlortetracycline (Aureomycin)	139	0	0.6 to 6.0 μg.
Bacitracin	40	4	0.8 to 3.1 u.
Sulfadiazine	45	37	500 μg.

isms were sensitive to streptomycin at concentrations between 4 and 15 micrograms per milliliter. (Some organisms recovered from the blood cultures were resistant to ten but susceptible to 20 micrograms per milliliter.)

Streptomycin in the blood, which assayed in a range between 18 and 76 micrograms per milliliter, seemed to be in adequate quantity to affect some of the organisms; streptomycin levels in the saliva, ranging from 0.75 to 5.5 micrograms per milliliter, were too low. There was no significant change in the bacterial population count of the saliva.

Group 4—Penicillin-streptomycin • The incidence of bacteremia in patients receiving combined penicillin-streptomycin injections was 26.4 per cent immediately after extraction; 11.7 per cent ten minutes after. Corresponding figures for patients experiencing mild and heavy trauma had high statistical significance.

In two instances, organisms were present in the preoperative samples. *Staphylococcus albus nonhemolyticus* was recovered in both instances. These organisms may be considered as contaminants.

Antibiotic assays were as follows: 0.4 to 4.2 units penicillin per milliliter and 4 to 32 micrograms streptomycin per milliliter in the blood; 0.013 to 0.058 unit penicillin per milliliter and 1.1 to 4.3 micrograms streptomycin per milliliter in the saliva. In this group, as in the others, there was no correlation between levels of antibiotic found concomitantly in a patient's blood and saliva. Possibly variations in blood and saliva volume and rate of absorption from the depot site may obscure the relationships.

Bacterial population counts in the saliva were reduced from an average of 43 million to 13 million organisms per milliliter, a reduction of approximately 65 per cent.

The comparatively low incidence of bacteremia in this group immediately after extraction hardly can be the result of antibiotic action in the blood alone, as the lethal effect requires passage of time. It is better explained in terms of the low bacterial count at the source. (See Discussion.)

Group 5—Chloramphenicol • Bacteremia was found in 21.8 per cent of the chloramphenicol-treated patients immediately after extraction; 12.5 per cent ten minutes after.

Five organisms displayed resistance to chloramphenicol at 0.8 to 9.3 micromilligrams per milliliter. Chloramphenicol concentrations ranged from 2 to 32 micrograms per milliliter of blood, 0.9 to 3.5 micrograms per milliliter of saliva,

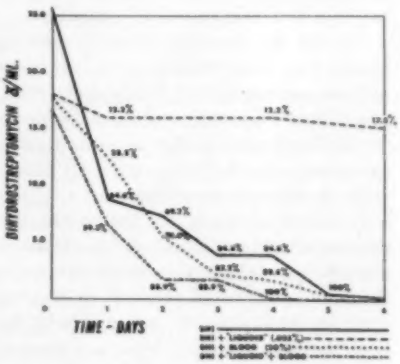

Fig. 1 • Rate of destruction of dihydrostreptomycin sulphate in brain heart infusion broth

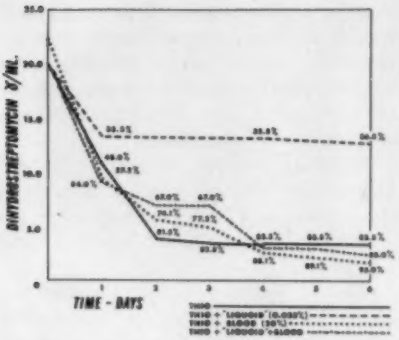

Fig. 2 • Rate of destruction of dihydrostreptomycin sulphate in thioglycollate broth

at the end of one-half hour. Bacterial population in the saliva was reduced from 42 million to 25.5 million organisms per milliliter.

The validity of the population count and the bacteremia data is in doubt. Apparent bacterial population reduction in the saliva may be within the limits of experimental error. No inactivator is available for chloramphenicol, so culture results may include false negatives.

Group 6—Troche A • Local application of antibiotics, using troche A, reduced the incidence of bacteremia to 40.5 per cent immediately after extraction; 8.1 per cent ten minutes after extraction.

Troche A was effective in preventing bacteremia after mild trauma; all blood cultures were negative. It had some effect after heavy trauma, reducing incidence to 62.5 per cent and ten minutes after extraction to 12.5 per cent. All results were statistically significant.

Antibiotic activity in the saliva was measured at four intervals by means of filter paper disks immersed in the saliva specimens collected before extraction with results as follows: range of activity, in terms of zones of inhibition, at the end of the first half-hour, 19 to 46 mm.; first hour, 8 to 31 mm.; second hour, 0.0 to 15 mm.; fourth hour, no activity. The test organism used was *Staphylococcus aureus* 209.

Bacterial population counts continued to be depressed at the end of four hours even though no discernible amount of antibiotic was present.

Antibiotics could not be detected in the blood. The low incidence of bacteremia must be attributed to the local effects of the antibiotics.

Group 7—Troche B • Patients taking troche B (used instead of troche A, where penicillin sensitivity is a consideration) developed bacteremia in 53.0 per cent of cases immediately after extraction; 13.8 per cent ten minutes after extraction. These results are statistically significant.

Results following mild and heavy trauma were similar to those with troche A, although somewhat less decisive and not statistically significant for mild trauma (11.1 per cent), but statistically significant for heavy trauma (20 per cent). The discrepancy in statistical significance

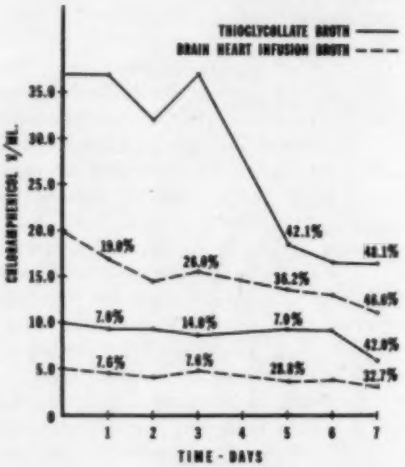

Fig. 3 • Rate of destruction of chloramphenicol in blood culture flask containing 4 ml. human blood fortified with 0.333% Liquoid in 20 ml. broth

between trauma 2 and trauma 1 cannot be explained. It may be due to the small number of patients included in the analysis.

Antibiotic activity of the saliva was 10 mm. (zone of inhibition) at the end of the first half-hour using the *Staph. aureus* 209 as the test organism; there was no activity at the end of the second hour. Bacterial counts continued to be depressed even at the end of the fourth hour.

Troche B, compared with troche A, depressed bacterial counts in saliva more, but affected incidence of bacteremia less. (A control study in which placebos were used showed no reduction in bacterial count.)

It is probable that the bacterial population counts in the troche A group have the greater validity. Troche B results are subject to the criticism that no inactivator is available for the antibiotics in the saliva specimens that were cultured. However, troche B blood culture data are valid, as detectable antibiotic does not get into the blood from the use of troches.

The somewhat superior effectiveness of troche A in preventing bacteremia may be explained by the greater number of organisms in the mouth which are more penicillin-sensitive.

Group 8—Parenteral Antibiotic-Troche A • Combined local and systemic therapy produced the greatest reduction in the incidence of bacteremia. Whereas 84.9 per cent of the control patients developed bacteremia after extraction, only 17.1 per cent of the patients receiving penicillin-streptomycin injections plus troche A had bacteremia. Only 5.7 per cent of the combined therapy group had bacteremia ten minutes after extraction. These results, of course, have high statistical significance, both collectively and on trauma analysis.

Organisms in the saliva were reduced from an average of 24.3 million to 1.4 million per milliliter of saliva. These figures indicate that large numbers of organisms are destroyed or weakened at the source.

Group 9—Parenteral Antibiotic-Troche B • Combined local and systemic therapy using troche B is second only to combined therapy using troche A as a means of preventing postextraction bacteremia. Immediately after extraction, only 23.5 per cent of the patients had bacteremia; ten minutes later the incidence of bacteremia had fallen to 8.8 per cent. Again the results are highly significant if analyzed either on the basis of mild and heavy trauma or collectively.

Inactivation of Antibiotics in Culture Media • Antibiotics in the blood continue to act on bacteria in the culture flask. Unless inactivators are added to the culture medium or the culture medium itself acts as an inactivator, false negative cultures will be obtained. Inactivation was investigated as follows:

1. Penicillin: additional blood was taken from the penicillin group patients so that culture with and without the addition of inactivator (penicillinase) could be compared. In the flasks containing no penicillinase, only 6.2 per cent of the blood samples taken immediately after extraction showed bacterial growth, in contrast with 53.1 per cent if penicillinase was present. Not one of the penicillinase-free samples representing blood taken ten minutes after extraction showed growth, although 26.7 per cent were positive if penicillinase was present.

2. Streptomycin: inactivator was not added to the culture medium, as the medium itself inactivates streptomycin. To make sure, studies were made on the rate of destruction of dihydrostreptomycin sulfate in brain heart infusion broth and in thioglycollate broth. As blood and Liquoid were also present, the effects of these materials, singly and in combination, were also studied.

Streptomycin in brain heart infusion

broth (Fig. 1) was inactivated about 65 per cent after the first day; by the end of the fifth day it was completely inactivated. Liquoid added to the broth interfered with the inactivation seriously; but if blood was present, with or without Liquoid, streptomycin was inactivated within four days.

Similar results were obtained in thioglycollate broth (Fig. 2). This explains why bacterial growth ordinarily did not appear in the streptomycin group cultures until the end of the fourth day, whereas control group cultures usually showed growth at the end of two days.

3. Chloramphenicol: a study was made (Fig. 3) which showed that 50 to 70 per cent of the chloramphenicol was still present in the medium at the end of the seventh day.

DISCUSSION

These studies support the hypothesis of Burket and Burn[21] that the source of the organism in postextraction bacteremia is to be found in the gingival sulcus. Instances of subacute bacterial endocarditis have been reported involving almost every organism present in the mouth.[22] Streptococcemia is found most frequently merely because streptococci are the commonest organisms in the mouth.

The comparative studies show that if concentration of antibiotics in the saliva is high enough, the number of bacteria in the mouth is reduced; and that if the number of bacteria in the mouth is reduced, there is a lowered incidence of bacteremia.

The concentration of antibiotics in the saliva can be increased by slowly dissolving an antibiotic troche in the mouth; the troche supplements the antibiotics which are excreted into the saliva from the blood stream.

The greatest reduction in the incidence of bacteremia was obtained by a combined systemic and local therapy: the intramuscular injection of a combination of penicillin and streptomycin followed by local application of antibiotics in the form of a troche.

The penicillin-streptomycin mixture is particularly effective because (1) the combination increases the spectrum of antibacterial activity, (2) the additive effect obtained by combining the two antibiotics produces a greater concentration of an antibacterial agent, and (3) there may be a synergistic action, as has already been demonstrated, for a number of different strains of organisms isolated from the blood.[17]

The antibiotics in the saliva reduce the number of organisms in the mouth and weaken many of the survivors. Fewer organisms enter the blood stream through the tissues injured during tooth extraction, and those that do may be too weak to withstand the body defenses or the further action of antibiotics in the blood.[23]

Rules for Prevention of Postextraction Bacteremia • Oral surgery is a serious risk for patients with heart damage. No prophylactic measures can be depended on entirely to prevent onset of bacteremia and its sequel, subacute bacterial endocarditis. However, rules can be formulated from this and other studies which should be helpful in controlling postextraction blood stream infection.

1. All patients should be questioned closely before extraction or other dental surgery is undertaken, to elicit any history of heart disorder, rheumatic fever, scarlet fever, pains in the joints, "growing pains," frequent "sore throats," or chorea. If conditions suggesting rheumatic diathesis are present, the patient should be warned of possible complica-

21. Burket, L. W., and Burn, C. G. Bacteremias following dental extraction. Demonstration of source of bacteria by means of a non-pathogen. (Serratia marcescens.) J. D. Res. 16:521 Dec. 1937.

22. Jones, Marion. Subacute bacterial endocarditis of nonstreptococcic etiology; review of literature of 13 year period 1936-1948 inclusive. Am. Heart J. 40:106 July 1950.

23. Eagle, H. Symposium on antibiotics; recovery of bacteria from toxic effects of penicillin. J. Clin. Invest. 28:832 Sept. (pt. 1) 1949.

tions. He should be seen by a physician. Dentist and physician should consult before oral surgery is begun.

2. When possible, manipulation of the gums and teeth should be avoided if the patient has congenital malformations of heart or has had disease liable to damage the endocardium. Root canal therapy, if feasible, is preferable to tooth extraction. It produces less trauma. (Subacute bacterial endocarditis has never been reported after endodontic treatment.)[24]

3. Local anesthesia, with procaine hydrochloride, should be used in preference to general anesthesia. It has been observed that extraction under local anesthesia can usually be performed with less trauma. (Vilardo[25] demonstrated increased bactericidal and phagocytic properties in the blood of rabbits, with enhancement of the antibacterial functions of the reticulo-endothelial system after subcutaneous injection of procaine.)

4. Only one tooth at a time is removed. This should be done with a minimum of rocking and trauma. Multiple extraction is contraindicated if heavy trauma is likely to be encountered.

5. Antibiotics should be administered as follows:

a. One hour before extraction, a combination of 400,000 units of fortified penicillin and 1 Gm. of streptomycin is injected intramuscularly. (When administered intramuscularly, there appears to be no need for antibiotics to be given 24 hours beforehand as sometimes recommended. Within 24 hours, most of the antibiotic is no longer present in the blood stream. Antibiotic remaining in the saliva that long may so alter the flora of the mouth that only resistant organisms will survive, and the ensuing bacteremia may be more difficult to control.)[26] Patients sensitive to penicillin may receive a broad spectrum antibiotic. This has been suggested by the American Heart Association.

b. One-half hour before extraction is performed, the patient is given one Sulpondet troche (A), to be dissolved slowly in the mouth. If the patient is penicillin-sensitive, he is given a Wybiotic troche (B) instead.

c. Twelve to 24 hours after extraction another 400,000 units of fortified penicillin and 1 Gm. of streptomycin may be injected for additional protection if desired. Administration of oral penicillin also may be continued as long as desired to prolong the presence of antibiotic in the blood stream. However, dependence on oral penicillin solely as a means of protection in these patients should not be considered.

SUMMARY AND CONCLUSIONS

Methods of preventing the bacteremia which follows tooth extraction were investigated. Three hundred and fifty-seven patients were divided into control and experimental groups, and eight different types of preoperative antibiotic therapy were compared: penicillin; streptomycin; penicillin-streptomycin mixture; chloramphenicol, administered intravenously; two kinds of antibiotic troches for local administration and two combinations of parenteral antibiotics with troches. Studies included blood cultures, bacterial population counts in the saliva, identification and frequency count of isolated organisms, *in vitro* sensitivity tests of organisms, and assays of antibiotic level in blood serum and saliva. Incidence of bacteremia immediately after extraction and ten minutes after extraction was evaluated, taking into consideration the degree of trauma sustained

24. Kolmer, J. A. Focal infection of dental origin in relation to disease. Transactions of the World Conference on Endodontics, 1953.

25. Vilardo, S. Contributo allo studio dei fenomeni immunitari nell'anestesia locale novocainico; potere battericide e potere fagocitario del sangue. Gior. di batteriol. e immunol. 20:1201 June 1938.

26. Weinstein, L.; Goldfield, M., and Chang, T. W. Infections occurring during chemotherapy; study of their frequency, type and predisposing factors. New England J. Med. 251:247 Aug. 12, 1954.

during the operation. The following conclusions were drawn:

1. The hypothesis that the organisms in postextraction bacteremias are the normal inhabitants of the mouth which gain entrance to the blood stream through the traumatized gingival sulcus was confirmed.

2. The incidence of bacteremia can be reduced by minimizing the operative trauma.

3. The incidence of bacteremia can be reduced by increasing the concentration of antibiotics in the saliva.

4. The administration of a single antibiotic is of only limited effectiveness.

5. The most effective treatment was a combination of systemic and local therapy as follows: an intramuscular injection of a penicillin-streptomycin mixture one hour before tooth extraction plus an antibiotic troche, to be slowly dissolved in the mouth, taken one-half hour before extraction. The troche contains penicillin, bacitracin, sulfadiazine, and benzocaine. A slightly less effective troche, for use with penicillin-sensitive patients, contains neomycin, bacitracin, and polymyxin.

6. Rules are given for the protection of patients with heart valve damage against postextraction bacteremia, a common cause of subacute bacterial endocarditis.

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Comparative local anesthetic potencies of lidocaine and metabutoxycaine

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Monheim[1] reported that metabutoxycaine hydrochloride was effective as a dental local anesthetic. Using this drug in 1.5 per cent solution alone or with concentrations of epinephrine from 1:50,000 to 1:400,000, he observed profound anesthesia in 469 out of 470 injections.

Additional data on metabutoxycaine hydrochloride were cited in his report. They represented 3,016 injections performed at 15 dental schools. Of these, 2,059 were of 1.5 per cent solution. Profound anesthesia was reported in 1,932 instances (93.8 per cent). When 1.5 per cent metabutoxycaine hydrochloride was supplemented with epinephrine in concentration equal to or stronger than 1:200,000, profound anesthesia was reported in 1,790 of 1,914 injections (93.5 per cent).

Also evident in this compilation of results is that the concentration of vasoconstrictor is not critical so far as frequency of profound anesthesia is concerned, though Monheim observed that the duration of anesthesia was longer with the higher concentrations of vasoconstrictor.

The experience of Monheim indicates that 1.5 per cent solution of metabutoxy-

This study was aided in part by support from the Novocol Chemical Manufacturing Co., Inc.

Department of physiology and pharmacology, Northwestern University Dental School.

1. Monheim, L. M. New local anesthetic agent: preliminary report. J.A.D.A. 50:633 June 1955.

Table 1 • Sequence of medication

Subject	Exper. 1	Exper. 2	Exper. 3	Exper. 4
1	A*	B†	C‡	D§
2	B	C	D	A
3	C	D	A	B
4	D	A	B	C
5	D	C	B	A
6	C	B	A	D
7	B	A	D	C
8	A	D	C	B

*A, 2% lidocaine hydrochloride + 1:50,000 epinephrine hydrochloride.

†B, 1.5% metabutoxycaine hydrochloride + 1:50,000 epinephrine hydrochloride.

‡C, 2% lidocaine hydrochloride + 1:100,000 epinephrine hydrochloride.

§D, 1.5% metabutoxycaine hydrochloride + 1:100,000 epinephrine hydrochloride.

caine hydrochloride will produce dental local anesthesia. However, its parameters (rate of onset, profundity and duration) relative to other dental local anesthetics are not established. Since, in the study cited, no other agents were studied and no controls over suggestion to patient or observer were exercised, the relative toxicity of this anesthetic agent is not established either.

Whenever a new compound is introduced to the field of therapeutics, it is important to determine its advantages over existing compounds. To aid in such decisions, an important factor is the margin of safety of the drug. This means the ratio of effective dose to toxic dose or the difference between the effective dose and the toxic dose. As a step in determining this factor, the study to be described was undertaken.

METHOD

Metabutoxycaine hydrochloride (Primacaine HCl) was compared to lidocaine hydrochloride (Xylocaine Hydrochloride) by Adilman's[2] modification of Everett's[3] method. This involves determination of the minimal quantity of electricity necessary to elicit pain when applied to a metallic dental restoration in human subjects, before and after injection of local anesthetics.

Stimuli were applied only to teeth which had metallic restorations in the occlusal surface, completely surrounded by enamel (Class I). These teeth were carefully dried before stimulation, in accordance with Björn's[4] caution, to prevent diversion of any applied current from the tooth pulp.

Stimuli were generated at a frequency of two per second. They were square waves of 1 millisecond's duration. Current was increased until a subject indicated he felt pain. The amount of current applied was recorded, and the procedure was repeated immediately; care was taken to make the interval from the beginning of stimulation to threshold irregular to

2. Adilman, H. B. Experimental comparison of local anesthetics in the human oral cavity. Northwestern Univ. Bul. 54:10 March 1954.

3. Everett, F. G. Comparison of depth of anesthesia and toxicity of two and four per cent procaine hydrochloride solution. J. D. Res. 28:204 June 1949.

4. Björn, H. Electrical excitation of teeth and its application to dentistry. Svensk tandläk. Tskr. (Suppl.) vol. 10, 1946.

Table 2 • Average increments of thresholds of eight subjects after infiltration anesthesia, in volts

Minutes after inject.	1.5% metabutoxycaine +epinephrine 1:50,000	1:100,000	2% lidocaine +epinephrine 1:50,000	1:100,000
2	4.79	3.78	5.71	3.76
4	9.11	9.94	11.77	8.99
6	13.80	10.52	12.76	11.59
8	12.31	12.02	13.77	11.60
10	12.45	11.47	13.76	11.87
15	10.83	9.04	13.54	11.78
20	8.47	7.87	12.07	11.67
25	4.34	5.94	8.60	9.31
30	3.25	4.73	7.35	6.81
35	2.84	3.40	5.14	4.60
40	1.82	1.47	4.01	2.48
45	0.41	1.25	4.17	0.73
50	0.39	0.60	2.90	0.32
55	0.22	0.39	2.47	0.38
60	0.24	0.29	1.96	0.23
65	0.21		0.43	
70				
75				
80				
85				
90				

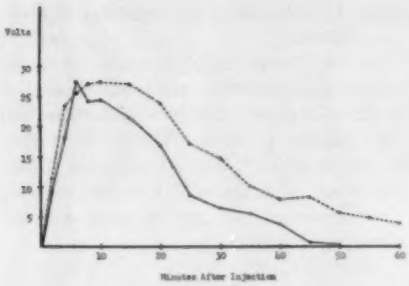

Fig. 1 • Average increment of threshold, in volts, above premedication thresholds. Solid line = 1.5 per cent metabutoxycaine hydrochloride + 1:50,000 epinephrine hydrochloride. Interrupted line = 2 per cent lidocaine hydrochloride + 1:50,000 epinephrine hydrochloride. Each of eight subjects received 0.5 cc. of each solution on separate occasions

prevent any temporal cue to the subject. Such procedure, taking thresholds in duplicate, was repeated at three five-minute intervals before local anesthetic injection. After injection, duplicate threshold determinations were made at two, four, six, eight and ten minutes and five-minute intervals thereafter, until the threshold returned to the preinjection value.

Injections were made with Huber point needles as infiltrations over the stimulated tooth; care was taken to prevent intravenous injection. The volume injected was always 0.5 cc. The identity of the solution injected was always under code to prevent any bias by operator or subject from confounding results.

To minimize any influence of training or adaptation on results, each compound studied was first as often as second, and so forth, that is, a "Latin square" treatment sequence was employed. This is exemplified in the protocol of injections in Table 1. The minimum interval between experiments was 48 hours. In any one subject, the same tooth was stimulated in all four experiments. Eight men volunteered as subjects for these experiments. The four compounds tested were 2 per cent lidocaine hydrochloride plus 1:50,000 and 1:100,000 epinephrine hydrochloride obtained on the open market and 1.5 per cent metabutoxycaine hydrochloride plus 1:50,000 and 1:100,000 epinephrine hydrochloride prepared especially for this experiment.

RESULTS

Each man's increment from his average preinjection threshold has been calculated for each postinjection threshold determination and each anesthetic compound. In turn, these have been combined to provide the average threshold increments for each postinjection observation interval presented in Table 2. To facilitate comparison of these values they have been presented graphically in Figures 1 and 2. Figure 1 compares 2 per cent lidocaine hydrochloride with 1.5 per cent metabutoxycaine hydrochloride when the vasoconstrictor is 1:50,000 concentration, and Figure 2, when the epinephrine is 1:100,000 concentration. Gross observation of these values suggests that metabutoxycaine hydrochloride produced anesthesia of the same order of profundity as lidocaine hydrochloride but of shorter dura-

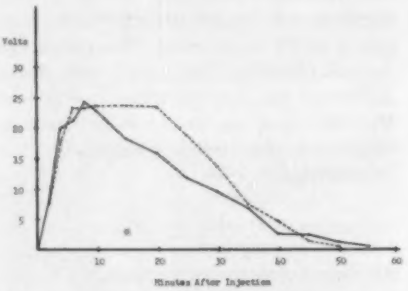

Fig. 2 • Average increment of threshold, in volts, above premedication thresholds. Solid line = 1.5 per cent metabutoxycaine hydrochloride + 1:100,000 epinephrine hydrochloride. Interrupted line = 2 per cent lidocaine hydrochloride + 1:100,000 epinephrine hydrochloride. Each of eight subjects received 0.5 cc. of each solution on separate occasions

Table 3 • Analysis of variance 2 to 25 minutes inclusive

Source	Degrees of freedom	Mean square	"F" ratio	
Subjects	7	2517.6424	10.522*	
R†	3	330.2668	1.380	R/SR
S x R	21	239.2786	6.186*	SR/SRT
Times	7	1039.7496		
S x T	49	111.2552	2.876*	ST/SRT
R x T	21	44.0483	1.139	RT/SRT
S x R x T	147	5686.2517		
	255			

*P < 0.01.
†R indicates treatments.

tion. The rates of onset were nearly identical.

Since the differences observed in the graphs are small and each point represents the average increment of eight subjects, conclusions based on visual impressions are not necessarily representative.

To determine if such differences might be due to the treatments instead of coincidence, the data were subjected to statistical analyses. In the first analysis, which is summarized in Table 3, the effects of administration of all four compounds on the thresholds have been compared during the 2 to 25 minute postinjection interval by analysis of variance. The results clearly indicate that there is no statistical significance to the differences between the effects of the four compounds during the first 25 minutes after injection.

To explore this in more detail and to ascertain if the comparative brevity of metabutoxycaine anesthesia is real or coincidental, the data for each observation time were explored by analysis of variance. These results are summarized in Table 4. It may be seen that statistically significant differences between threshold-raising effects first appeared 15 minutes after injection when the two averages for lidocaine hydrochloride were significantly higher than the two averages for metabutoxycaine hydrochloride at the 5 per cent level of probability. In other words, the effect of the metabutoxycaine hydrochloride was diminishing more rapidly than the effect of the lidocaine hydrochloride 15 minutes after injection. These differences were confirmed by similar differences at 20 minutes, but at the 1 per cent level of probability.

At 15, 20 and 25 minutes after injection—as well as at the earlier intervals—the difference between threshold elevations produced by lidocaine hydrochloride (A and C) with the two concentrations

Table 4 • Summary of analyses of variance, by observation intervals

Time in minutes	Source	Degrees of freedom	Mean square	"F" ratio
2	Subjects	7	354.4409	3.637*
	Treatments	3	27.9668	0.287
	Error	21	97.4398	
4	Subjects	7	391.5184	3.298†
	Treatments	3	52.6589	0.443
	Error	21	118.6967	
6	Subjects	7	414.8871	6.19*
	Treatments	3	64.8216	0.968
	Error	21	66.9604	
8	Subjects	7	516.5093	19.305*
	Treatments	(3)	(28.3808)	(1.061)
	BCD	2	4.1131	0.153
	(A) (BCD)	1	76.9163	2.875
	Error	21	26.7547	
10	Subjects	7	533.2140	20.263*
	Treatments	(3)	(31.8550)	(1.211)
	BCD	2	7.7512	0.294
	(A) (BCD)	1	80.0627	3.042
	Error	21	26.3153	
15	Subjects	7	435.6668	10.946*
	Treatments	(3)	(112.8360)	(2.835)
	AC	1	49.3155	1.239
	BD	1	51.4089	1.291
	(AC) (BD)	1	237.7835	5.974†
	Error	21	39.8001	
20	Subjects	7	406.1520	9.382*
	Treatments	(3)	(148.5561)	(3.432)†
	AC	1	2.5921	0.060
	BD	1	5.7360	0.132
	(AC) (BD)	1	437.3403	10.103*
	Error	21	43.2894	
25	Subjects	7	244.0405	2.688
	Treatments	(3)	171.5297	1.889
	AC	1	7.9524	0.088
	BD	1	40.6726	0.448
	(AC) (BD)	1	465.9641	5.132†
	Error	21	90.7960	

*P<0.01.
†P<0.05.

of epinephrine were not statistically significant. The same was true of the two metabutoxycaine hydrochloride solutions (B and D).

After these experiments were concluded, the solutions employed were subjected to chemical analyses. It was found that the concentrations of epinephrine in the lidocaine hydrochloride solutions (which had been on the premises about two years after manufacturing) were 1:55,500 and 1:108,600. In the metabutoxycaine hydrochloride solutions the epinephrine concentrations were 1:40,000 and 1:75,000.

Though the epinephrine concentrations of the metabutoxycaine hydrochloride solutions were higher than those of the lidocaine hydrochloride, direct comparison of effects is not greatly modified. It may be seen readily (Fig. 1 and 2) that profundity and duration of both local anesthetics were slightly and insignificantly different at the two levels of vasoconstrictor employed.

DISCUSSION AND CONCLUSION

In this rather direct approach to comparing dental local anesthetics, it was found that 1.5 per cent metabutoxycaine hydrochloride and 2 per cent lidocaine hydrochloride with vasoconstrictors of approximately comparable dilutions were capable of producing anesthesia in about the same time and of comparable profundity. It was found, under the conditions of the experiment, that 15 minutes after injection the effect of the metabutoxycaine hydrochloride had fallen below the effect of the lidocaine hydrochloride.

That metabutoxycaine hydrochloride would appear to compare favorably with lidocaine hydrochloride in the parameters of potency seems established. It is the opinion of the authors, however, that until comparison of the incidence, quality and severity of clinically occurring toxic reactions of both compounds has been made, complete comparison of the drugs has not been accomplished.

Education and Experience • Men are something more than one can assume from their occupations; they are human beings, with capacities for development largely unrealized, moving in a world of infinite interest. At the center of all their activities is a spirit, a soul, a personality, a biochemical entity, called man. This entity is shaped from outside by home atmosphere and upbringing, by school and college, by human contacts, by reading and by the experiences of life. It is shaped from within by thought which reviews and puts into order all its experiences. But as soon as men are swept into the stream of action there is little time for thought. Yet at forty a man is much more fitted to think than at twenty, because he knows much more of life and men. Unless his mind has stiffened, his insight into religious, moral, scientific and political questions is greater, because it is based on experience. Aristotle remarked that the young are not fit to be students of philosophy or politics "for they have no experience of life." But the more man has to think about, the less leisure he has to think, unless he is able to escape from the stream for a period and reflect on himself and on the world and life in the light of all time and all existence. *Richard Livingstone.*

Narcotic analgesics as adjuncts to dental practice

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The prevention and treatment of pain are common problems in the practice of dentistry. Pain is, however, such a complex and subjective phenomenon that it often taxes the ingenuity and skill of the dentist and physician. Even a definition of pain evades us, and as Sir Thomas Lewis[1] wisely wrote,

> Pain, like similar subjective things, is known to us by experience and described by illustrations . . . To build up a definition in words, or to substitute some phrase would carry neither the reader nor myself farther.

It is, accordingly, the purpose of this paper to describe briefly some of the characteristics of pain, and how they can be affected in dental practice. Although reference will be made to other agents, the main emphasis of this brief review will be on narcotic analgesics.

SOME GENERAL CHARACTERISTICS OF PAIN

Pain is both a symptom and a sensation. As a symptom, pain signals danger and thus provokes appropriate reflexes. Sherrington,[2] accordingly, described pain as "the psychical adjunct of an imperative protective reflex." From a therapeutic viewpoint, pain is a valuable clinical symptom to the practitioner.

It also follows that the management of pain—a symptom—must be subject to the same limitations as any other palliative or symptomatic treatment. Because pain is also a sensation, it is a highly personal and individual experience. Variations in the sensation experienced by different individuals in response to the same noxious stimulus are to be expected, but there are also wide differences in the response of the same individual. For example, one would expect that the reaction of a phlegmatic, stoic patient to the dental bur would be quite different from that of a nervous, "high-strung" woman. Yet the same stoic might behave in another fashion if he came to the dentist's office after a distressing experience with the Bureau of Internal Revenue. Or the same nervous woman might be more complacent if she arrived at the office after a triumphant session at the bridge table. Thus, the reaction to pain often differs in the same individual as well as between individuals.

As a physiologic entity, pain can be considered as being composed of at least the following:

This paper has been authorized for publication by the Council on Dental Therapeutics.

Division of anesthesiology, University of Illinois College of Medicine and the department of oral and maxillofacial surgery, University of Illinois College of Dentistry.

1. Lewis, Thomas. Pain. New York, Macmillan Co., 1942.

2. Sherrington, C. Integrative action of the nervous system. New Haven, Yale University Press, 1947.

1. Initiation of stimulus.
2. Transmission of impulse into the central nervous system.
3. Perception and integration.
4. Reaction.

The initiation of the "painful" impulse can be triggered by a large variety of stimuli, but in general, these stimuli have as a common characteristic, a threat to the integrity of the body tissues. Some examples are pressure, heat, and tension. The impulses are carried centrally through a maze of interlocking and associated nerves so that there are enormous differences in the character of the transmission from different areas and structures in the body.

The awareness of pain, or the sensation of pain, as a part of consciousness is the result of the effect of the stimuli on the thalamocortical complex. The higher centers act in concert to integrate the "pain" impulses from among the other signals of bodily and environmental changes. The reaction to pain is a function of the thalamocortical complex, and it necessarily follows that anything which affects these higher centers may alter the sensation of, or the reaction to, pain. As a result, physiologic, psychologic and environmental factors can and do play a large role in the character of the pain complex.

Since pain is composed of many phenomena, each of which has tremendous capacity for variation, it should not be surprising that every clinical pain problem tends to be unique. A necessary consequence of these considerations is that there is no single method that will be effective and practical in the management of all types of pain. The one possible exception is the removal of the cause of pain, but unfortunately, this is not always easily or readily done.

PAIN THRESHOLD

The determination of the pain threshold is a most useful technic, particularly in the practical assay of new analgesic drugs and the definition of the properties of known agents. Physiologists have determined the minimal stimulus necessary to provoke a typical action or function of a number of sensory systems. For example, the minimum number of decibels of each pitch which will produce the sensation of sound is used in determining the threshold for the auditory system.

Pain threshold, however, is more elusive, for there are so many variations in the nature of the provocative stimuli, their transmission, and above all, the complexities of central integration and interpretation. Moreover, in our measurements we are dependent on the observed reaction to pain, or the spoken response, "I can just feel the pain now." In summary, we cannot quantitatively measure the sensation of pain, and we must rely on an interpretation which provokes a reaction. The integration and interpretation of the pain stimuli among all the other stimuli bombarding the thalamocortical complex are obviously influenced by psychologic and environmental factors as well as physiologic influences. Absolute control or stabilization of all of these influences is impossible, and the best that can be done is to try to approximate ideal conditions.

In spite of the limitations of the technics, useful and valuable information can be gathered from the determination of pain thresholds in man. For example, the increase in pain threshold produced by narcotic analgesics gives a valuable measure of the intensity of the analgesia they produce. Thus it is possible to assay and compare the intensity, onset, and duration of analgesia of known and experimental drugs. Such experiments provide the basis for the use of specific analgesics to meet different types of clinical pain.

Two types of experiment are commonly used for the determination of pain thresholds in man. The Wolff-Hardy-Goodell technic for the application of radiant heat to the forehead is best known

but has some limitations.[3] The electrical stimulation of teeth (tooth pulp algesimetry) is gaining wider recognition as a more useful and precise method of measurement of pain threshold in both animals and men. Harris and his associates[3,4] of Northwestern University Dental School have contributed much to the development and refinement of this technic.

GENERAL METHODS FOR RELIEF OF PAIN

There are at least five general technics for the relief of dental pain:

1. Prevention or reduction of factors causing pain.
2. Reduction of fear and anxiety.
3. Use of systemic analgesic drugs.
4. Peripheral interruption of nerve conduction.
5. General anesthesia.

The prevention or reduction of factors causing pain is of major importance in dentistry. Inflammation is a common cause of pain, hence any measure which would reduce or prevent inflammation is likely to be useful. Just as the surgeon is trained to handle tissues gently, so the dentist must avoid unnecessary trauma and injury during operative procedures. The idea of preventing pain should be a primary influence on every dental technic; for example, the bur should be kept cool, and injections should be made slowly. The proper diagnosis and clinical interpretation of dental pain are of major importance. These factors become critical in those instances where the patient has symptoms which bring him to the dentist, but the cause of pain lies within the field of treatment by a specialist or a physician. An example of this type of problem is trigeminal neuralgia (tic douloureux). The dentist has, in many instances, the first opportunity to make the differential diagnosis.

The reduction of fear and anxiety are of major importance in the management of pain. This important phase of dental practice begins as soon as the patient enters the waiting room. The judicious and intelligent use of placebos may be very rewarding. For example, the dentist may prepare to give the patient a white placebo capsule while in the waiting room, hesitate, and then say, "No, I think I'll give you something a little more relaxing"—and proceed to give the patient a red placebo capsule. This is not a trick or a deception practiced on the patient; it is instead a surprisingly effective way to help the patient help himself.

The manner, deportment, and all of the actions of the dentist and his associates should be directed toward the instillation of confidence and trust. The most effective means of obtaining the patient's confidence is to earn it. Analgesia sufficient to overcome the patient's pain should be provided so that his total experience in the office teaches him that he will not be made to suffer. Two local anesthetic blocks should be used where one may not be sufficient, adequate doses of salicylates should be given whenever they are used, and a narcotic should be provided in case the pain does not respond to the salicylates.

The systemic analgesic drugs are commonly divided into two groups, addicting and nonaddicting. The former will constitute the major subject of this review. The nonaddicting systemic analgesics are widely used in dentistry. The salicylates, paraminophenols and the pyrazolones are best known. Aspirin, phenacetin, and antipyrine, respectively, exemplify these three groups. They are sometimes classified as the "antipyretic analgesics" to differentiate them from the narcotic analgesics. There are over 250 proprietary drugs which contain one or more of the antipyretic analgesics.[5] Their popularity and

3. Harris, S. C. Problems of experimental algesimetry. J. Chronic Dis. 4:52 July 1956.

4. Harris, S. C., and Blockus, L. E. The reliability and validity of tooth pulp algesimetry. J. Pharmacol. & Exper. Therap. 104:135 Feb. 1952.

5. Gross, E. G., and Schiffrin, M. J. Clinical analgetics. Springfield, Charles C Thomas, 1955.

widespread use is attested to by the annual consumption of about nine million pounds of salicylate preparations in the United States. They are used primarily for pain of neuralgia, myalgia, and headache, but are of very little or no value in deep visceral pain. The mechanism of their action is a combination of analgesic, antipyretic, and anti-inflammatory components.

There is increasing evidence that the analgesic effects of this class, and particularly the salicylates, are produced in largest part by their anti-inflammatory activity.[6] If this is so, then it might be proper to consider these drugs as something other than analgesics, since they reduce the cause (inflammation) of the pain. Be that as it may, it appears that there is at least one important clinical consideration of this property in the practice of dentistry. That is, to treat the patient with salicylates before the procedure. For example, the administration of 600 mg. of aspirin an hour before operation may be very effective in controlling pain when inflammation is present or anticipated. Why must the dentist wait until pain and inflammation are present before he gives salicylates?

The usual dose of the individual antipyretic analgetics is 320 to 640 mg. (5 to 10 grains) orally, as necessary. This amount is frequently reduced when these agents are combined with other drugs. Aspirin is effective, is seldom toxic in the usual doses, and is rapid acting. We are not convinced that there is any significant advantage to be gained by the addition of antacids.

Serious toxic results of a single dose are almost completely restricted to allergic individuals who may display a considerable hypersensitivity to the drug. Salicylate poisoning in children is, however, a most serious problem.[7] Chronic administration of salicylates may result in intoxication. The lowering of blood prothrombin levels, and the subsequent derangement of the clotting mechanism are of importance in dentistry. The early signs of salicylate intoxication are similar to those of quinine; namely, tinnitus, and visual disturbances, tachycardia, hyperpnea, central excitation, fever, dermatitis and mucosal hemorrhage may occur.

The toxicity of the para-aminophenol derivatives (acetanilid and phenacetin) is generally associated with their continued use over a long period of time. These drugs produce methemoglobin with the consequent cyanosis and characteristic bluish color of the mucosa, skin, and fingernails. Chronic toxicity of the para-aminophenols is unfortunately encouraged by the habit of taking nonprescription headache powders or pills, and the fact that the symptoms of toxicity (cardiac or pulmonary) are not recognized as warning signs by the layman. Indeed, he may consider these symptoms as indications of need for continuing to dose himself with these drugs. Recent reports of renal toxicity induced by phenacetin have caused renewed interest in N-acetyl-p-aminophenol. The latter is a metabolic derivative of phenacetin and appears to have analgesic activity similar to the parent compound.

The pyrazolone derivatives (antipyrine and aminopyrine) have the disadvantage of serious toxicity. Antipyrine produces changes in the hemoglobin and its toxicity is characterized by persistent pink to purple macular patches. Aminopyrine may produce fatal agranulocytosis. There seems little justification for the use of these agents as analgesics.

Combinations of salicylates and para-aminophenols with drugs such as caffeine, codeine, or a barbiturate are sometimes used to good advantage. The addition of a sympathomimetic drug, such as dextro amphetamine, to the antipyretic analgetics

6. Randall, L. O., and Selitto, J. J. A method for measurement of analgesic activity on inflamed tissue. Arch. Int. Pharmacodyn. 111:409 Sept. 1, 1957.

7. Erlanson, A. C., and Burke, E. C. Salicylate poisoning in children. Proc. Mayo Clin. 30:417 Sept 21, 1955.

may be advantageous in both the prevention and treatment of pain in dental practice.[8]

The peripheral interruption of nerve conduction is the dentists' mainstay in the prevention of pain. The distribution of the nervous pathways from the teeth centrally, and the character of the surrounding tissue, are admirably suited to the blocking of conduction by the use of the local anesthetics. In the absence of widespread inflammation or similar contraindications, the local anesthetics come close to the ideal analgesic for dental practice. The dense, close-knit tissue of healthy gums and palate tend to contain the anesthetic in the site of injection and delay the rapid absorption of these drugs, although the vascularity of these tissues favors more rapid absorption. From a theoretical standpoint, if nervous conduction from the periphery can be blocked, there should be complete or 100 per cent analgesia in that area.

The general anesthetics are primarily effective by virtue of their action on the thalamocortical complex. The loss of consciousness which they produce abolishes the sensation of pain, but it must be appreciated that they do not necessarily negate all physiologic reaction to pain. The hazards and disadvantages of general anesthetics must be weighed against their advantages whenever their use is contemplated.

PRINCIPLES OF THE NARCOTICS

The historical roots of the use of opium and its derivatives are buried in antiquity. The relief of human pain and suffering provided by the narcotics is a monumental achievement. The misuse of narcotics, and the hideous spectacle of addiction, are among the most dangerous abuses of these drugs. All of the narcotic analgesics have the following properties in common, although there are variations in degree:

1. Analgesia. These drugs obtund severe somatic and visceral pain.

2. Tolerance. The chronic use of these agents requires increasingly larger doses to provide adequate analgesia. There is evidence that tolerance begins with the very first dose, so that a second dose of the same size may not give as much analgesia as the first.

3. Addiction. The continued use of the narcotics results in a state of psychic and physical dependence. The addict will go to any length to obtain drugs for maintenance of his addiction. The sudden withdrawal of narcotics produces an involuntary physical and psychic state known as the "abstinence" or "withdrawal" syndrome.

4. Central depression. The narcotics produce sedation, hypnosis, and respiratory depression. The latter is usually the cause of death after a single large dose of a narcotic. The respiratory center can be depressed significantly by as little as 50 mg. of meperidine.[9]

5. Gastrointestinal effects. Nausea and sometimes emesis occur after a single dose by any route of administration. There is a delay in the emptying time of the stomach, consequently oral medication may not be absorbed reliably when given after a narcotic. Constipation usually follows the use of narcotics.

6. Effects on other systems. Other symptoms resulting from the use of narcotics are: euphoria, sense of well being, pupillary constriction, increased intrabiliary and cerebrospinal fluid pressures, hyperglycemia, peripheral vasodilation, vertigo, diaphoresis, pruritus, urticaria, oliguria, and cardiovascular depression.

The primary indication for the use of the narcotics is severe pain that cannot be controlled by other means. Narcotics are not to be used for their secondary effects such as sedation or hypnosis.

8. Harris, S. C., and Worley, R. C. Evaluation of a new analgesic. J. Appl. Physiol. 7:84 July 1954.

9. Schiffrin, M. J.; Balagot, R. C., and Sadove, M. S. Some effects of levallorphan on responses to meperidine. Canad. Anaes. Soc. J. 4:372 Oct. 1957.

Table • Some characteristics of narcotics

Generic name	Trade name	Equivalent analgetic dose (mg.)	Maximum analgetic intensity	Duration of analgesia	Sedation	Route of administration			
						Oral	S.C.	I.M.	I.V.
Morphine	morphine	10	2	3	3	1	3	3	3
Codeine	codeine	65?	1	2	1	2	3	3	
Dihydrocodeinone	Hycodan	10?	1	2	1	2	3		
Meperidine	Demerol	100	1	2	2	2	3	3	3
Dihyromorphinone	Dilaudid Hymorphan	2	3	2	3	2	3	3	
Metapon	Metapon	3	3	2	1	3			
Methadone	Methadone & others	10	3	3	2	3	3	3	
Alphaprodine	Nisentil	20	3	1	1		3	3	3
Levorphanol	Levo-Dromoran	2	3	3	2	3	3	3	3

1 = Comparatively slight effect or duration.
2 = Comparatively moderate effect or duration.
3 = Comparatively marked effect or duration.

The contraindications are: hepatic disease, myxedema, acute renal damage, concussion, skull fracture, pruritus, bronchial asthma, severe anemia and respiratory insufficiency. Narcotics should not be used for chronic pain unless the hazard of addiction is fully appreciated. In certain unstable individuals, even a short course of narcotics may produce psychic and physical dependence.

Some of the differentiating characteristics of the more common narcotic analgesics are summarized in the table. The maximum analgesic intensity (as determined by per cent increase in pain threshold) is of clinical importance in spite of the gaps in our knowledge. For example, codeine, dihydrocodeinone and meperidine, in maximum doses, produce about the same intensity of analgesia. If one of these drugs does not provide adequate relief of pain, then it would be advantageous to go to a group which produces a more intense analgesic effect. On the other hand, if intense analgesia, with short duration is required, alphaprodine would be a suitable choice. The table clearly indicates that the parenteral route of administration is, in most instances, more effective than the oral route. The exceptions are metapon, methadone and levorphanol, for these drugs are usually very effective when given orally.

The comparisons of sedative effect may be misleading. In most instances it is true, for example, that morphine produces more sedation than does alphaprodine. Yet every patient tends to respond individually as regards sedation, so there may well be patients who are excited by morphine and sedated by alphaprodine. In chronic pain situations, the physician may prescribe different narcotics consecutively until he finds the drug which works best in that particular patient. The dentist, on the other hand, seldom has the responsibility for giving narcotics over a long period of time to the same patient. The dentist's problem is usually related to an acute situation where the pain may be such as to require a narcotic. Under these circumstances he can choose a drug whose properties appear best suited to the circumstances. This method does not guarantee 100 per cent success, but it is the only intelligent way to handle a difficult problem, and it will have greater over-all success than any other means of selection.

Some of the new drugs which are currently receiving attention are: dihydrocodeine, anileridine, ethoheptazine and dextro-propoxyphene. Dihydrocodeine is not a new drug as it has been used in

Europe for many years. The original hope that this drug would produce analgesia of the same order as that of morphine, without respiratory depression, has not been fulfilled. A dose of 30 mg. dihydrocodeine has been recommended, as higher doses increase untoward reactions without adding materially to the analgesia. Dihydrocodeine is an addicting drug.

Anileridine (Leritine)[10] is about two to three times as potent as meperidine on a weight basis. Consequently, about 40 mg. of anileridine can be substituted for 100 mg. meperidine.[11] Anileridine is an addicting drug.

Ethoheptazine appears to be an analgesic of the codeine type without addiction liability. A combination of about 100 mg. ethoheptazine and 600 mg. aspirin is reported to be as effective as 30 mg. codeine with the same amount of aspirin.[12]

Dextro-propoxyphene (Darvon) is another new substitute for codeine which is stated to be of the same order of potency as codeine.[13,14] At this time there seems to be little or no addiction liability. The chief advantage of dextro-propoxyphene over codeine appears to be a significant reduction in the number of undesirable reactions particularly at the 65 mg. dose level.

NARCOTIC ANTAGONISTS

Nalorphine (Nalline) hydrochloride and levallorphan (Lorfan) tartrate are the two narcotic antagonists commercially available in this country. Their most important clinical characteristic is their ability to prevent or overcome all of the depressant effects of the narcotic analgesics. Consequently, their use has made the administration of narcotics safer by reducing the degree of respiratory depression. It must be emphasized that the narcotic antagonists are of no value in the management of depression caused by agents other than narcotics. The other pharmacologic characteristics of these drugs are as follows: they produce moderate analgesia of questionable clinical significance, overdosage with the antagonists causes sedation and respiratory depression, and they are of no value in the management of the abstinence syndrome. The antagonists can be used to:

1. Overcome severe depression produced by an overdose of a narcotic or an exaggerated response due to disease or idiosyncrasy.

2. Prevent respiratory depression by simultaneous administration with a narcotic, or by giving the antagonist before the narcotic.

In the management of narcotic toxicity the problem is to give the antagonist so that it will work quickly, and to give enough to be effective, while at the same time avoiding overdosage with the antagonist. This can be done by using the intravenous route for most rapid effect. Respiration is usually considerably improved within 2 to 3 minutes after intravenous injection. If the patient is not in shock, the intramuscular route may be used. The dose to be used is either 2.5 mg. nalorphine or 0.5 mg. levallorphan. Fortunately, the former is available in solutions containing 5 mg. per milliliter and the latter at a concentration of 1 mg. per milliliter. Therefore, 0.5 ml. of either solution is a safe and usually effective dose. If respiration improves but is still not adequate within five minutes, the dose can be repeated.

The prevention of respiratory depres-

10. Orahovats, P. D.; Lehman, E. G., and Chapin, E. W. Pharmacology of ethyl-1 (4-aminophenethyl-phenylisonipecotate, anileridine, a new potent synthetic analgesic. J. Pharmacol. & Exper. Therap. 119:26 Jan. 1957.

11. Keats, A. S.; Telford, J., and Kurosu, Y. Studies of analgesic drugs: anileridine dihydrochloride. Anesthesiology 18:690 Sept.-Oct. 1957.

12. Research reviews. Pain. J.A.M.A. 165:427 Sept. 28, 1957.

13. Gruber, C. M., Jr., and others. Effectiveness of D-propoxyphene hydrochloride and codeine phosphate as determined by two methods of clinical testing for relief of chronic pain. J. Pharmacol. & Exper. Therap. 118:280 Nov. 1956.

14. Gruber, C. M., Jr. Codeine phosphate, propoxyphene hydrochloride, and placebo. J.A.M.A. 164:966 June 29, 1957.

sion by the use of the antagonists has been studied most extensively. The antagonist can be given a few minutes before the narcotic or the two drugs can be mixed in the same syringe and given simultaneously. This use of levallorphan has been studied most thoroughly with alphaprodine, meperidine and levorphanol.[9, 15-19] The ratios by weight are as follows:

Alphaprodine: levallorphan, 50:1
Meperidine: levallorphan, 80:1
Levorphanol: levallorphan, 10:1

Thus, for example, 0.6 mg. levallorphan is used with 30 mg. alphaprodine, or 1.25 mg. levallorphan with 100 mg. meperidine.

Nalorphine (Nalline) is regulated by the laws applying to narcotics; therefore it must be obtained and handled in the same fashion as narcotic analgesics. Levallorphan (Lorfan) is free of these restrictions and its purchase does not require a narcotic order form.

FEDERAL REGULATIONS REGARDING NARCOTICS

It is assumed that every dentist is familiar with his state and city laws relating to the use of drugs. Narcotics are regulated primarily by federal law originating with the Harrison Narcotic Act. The dentist can become familiar with the essentials of the federal law for a total investment of 15 cents. For this fee, the U. S. Government Printing Office in Washington will provide a copy of the "Narcotic—Internal Revenue Regulations Relating to Importation, Manufacture, Production, Compounding, Sale, Dealing in, Dispensing and Giving Away of Opium or Coca Leaves or Any Compound, Manufacture, Salt, Derivative, or Preparation Thereof" (1938).

The essential points for the dentist who desires to administer narcotics are as follows: First, he must register with the district collector of internal revenue to secure a special tax stamp and registry number. The tax stamp must be displayed in the office where the drugs are used or dispensed. The registry number must appear on all prescriptions for narcotics. An annual inventory of narcotics must be filed. The purchase of narcotics for office use or dispensing must be made on special narcotic order forms which are obtained from the department of internal revenue. There is also a modest annual tax. The entire procedure is designed to provide for strict control and complete records. It is not unduly complex or burdensome in view of what it ultimately helps to give the patient; namely, judicious and proper use of narcotics for the alleviation and prevention of human suffering.

15. Cullen, S. C., and Santos, C. C. Analgesia for postoperative pain without respiratory depression. Anesthesiology 16:674 Sept. 1955.

16. Stoelting, V. K., and Hicks, M. L. Combined use of narcotic and narcotic antagonist in the supplementation of anaesthesia. Canad. Anaes. Soc. J. 3:107 April 1956.

17. Foldes, F. F., and others. Levallorphan and alphaprodine in anesthesia. J.A.M.A. 160:168 Jan. 21, 1956.

18. Gaard, R. C. Preoperative use of a combination of Levo-dromoran tartrate and new narcotic antagonist. Minn. Med. 38:637 Sept. 1955.

19. Hochuli, E. Lorfan als Morphinantagonist in Gynäkologie und Geburtshilfe. Schweiz. Med. Wschr. 87:1327 Oct. 26, 1957.

Cases and Comments

BURNING PAIN RELATED TO TRAUMATIC OCCLUSION

By John Oppie McCall, D.D.S., New York.

When symptoms of burning pain in the mouth are the complaint of a patient, the sensation is usually in the tongue or in regions of the lower jaw. In an unusual instance, however, a woman complained of severe burning pain in the gingiva around the upper anterior teeth and in the palate just posterior to them. She had consulted several dentists, but she stated that they could find no explanation for the symptoms.

The woman first came in for examination in February 1957. She was 32 years of age and in good health according to a medical report. She had had severe acne, but the condition was under control with diet restriction and vitamin supplementation. There was no indication of neurosis or emotional strain.

Preliminary oral examination showed a full complement of teeth except for the lower left second molar, which had been extracted some years previously. The mucous membranes of the throat and oral cavity were normal. The occlusion was excellent by orthodontic standards, and the teeth were entirely caries-free.

There had been some alveolar bone resorption, especially in the first molar region. Resorption was minimal in the incisor region. Noticeable but not extreme gingival recession was found throughout the dentition. There was no tooth mobility. A diastema was noticed between the upper right central and lateral incisors. The patient stated that this space had not existed in earlier years.

More critical study of the occlusion revealed an anterior overbite somewhat in excess of the optimal, and palpation indicated heavy stress in that region. Excessive anterior stress has been regarded as a cause of the formation of a diastema in the upper anterior region.

Since there was no other discernible factor that might be causing the burning pain, it was decided to reduce the overstress on the anterior teeth. The lower anterior teeth were shortened slightly and were beveled on their buccal aspects. The patient indicated at once that the overstress had been relieved.

At the second appointment, one week later, she stated that the burning sensation had been relieved completely. There had been no return of the symptom up to February 1958. The treatment of the periodontal disease was carried out in a routine manner.

DISCUSSION

When traumatic occlusion is present but there is no mobility of the affected teeth, there is frequently a heightened sensitivity of the teeth to thermal change, especially to cold. This seems to indicate that the overstress has caused a disturbance of the periodontal circulation, centering at the root apex, with resultant disturbance of the pulpal circulation. There is also concomitant excitation of the pulpal nerve supply. Relief is usually prompt after the traumatic occlusion has been relieved.

In the instance reported, it is evident that the chief response to the occlusal overstress was in the nerves supplying the pulps of the upper anterior teeth, with the resultant manifestation of burning pain referred to the adjacent soft tissues.

944 Park Avenue

PROPER OFFICE ILLUMINATION

By Jerome S. Mittelman, D.D.S., New York.

Dentists depend on good vision for successful practice. Use of the eyes under poor lighting conditions not only cripples them but adds greatly to tension in everyday office activity and diminishes efficiency. Irritability is reflected negatively in dentist-patient relationships. Anything that interferes with proper eyesight can be detrimental to almost every phase of dental practice.

Yesterday's dentists suffered eyestrain because of lack of enough illumination in the mouth. Their eyes had to penetrate a barrier of relative darkness for discernment of minute and important details. Although today's dentists have powerful projection-bulb lamps available and visibility in the mouth is far better, all too few have proper room illumination.

The contrast caused by looking from the brightly illuminated mouth to the bracket table

which is much less brightly illuminated necessitates constant adaptation on the part of the eyes. The pity is that many dentists are unaware that such contrast actually exists.

Electric companies in major cities have light analysis services. A lighting consultant can measure the number of foot-candles of illumination that are reflected from the mouth with the lamp at the proper distance and that are reflected from the bracket and accessory tables. Quite often his recommendations, if followed, can make for improvement in dental practice as well as in the general atmosphere and appearance of the office.

It should be noted that those dentists who operate with daylight flooding the room are exposing themselves to possible eyestrain during the winter months when, at twilight and at early sunset, the room illumination diminishes too slowly to be recognized by the busy practitioner. Unless the dentist has planned his office lighting well, he is exposed to extreme contrasts in brightness of illumination at the end of the day when he can least afford eyestrain. This dentist, above all, needs adequate room illumination.

Powerful operating lamps are necessary, but, for the practice of optimal dentistry and the preservation of the dentist's health, good room illumination is equally important.

30 East 60th Street

USE OF A SEPARATOR IN PLACING A CLASS III GOLD RESTORATION

By Merle B. McGee, D.D.S., Pittsburgh.

There is criticism of the use of separators in the placement of Class III gold foil restorations because of their supposed effect on the periodontal membrane. This criticism is not valid if the separator is used properly. There is never any need to move a tooth more than 2 mm. at the most. Histologically, there may be a slight amount of temporary change in the membrane, but this is quickly repaired. It must be remembered that the tough, fibrous components of this membrane lend themselves to healing. There is far more damage done to periodontal membranes by partial dentures with clasps than was ever done with separators.

An experienced operator is able to place a Class III gold foil restoration with very nominal use of a separator. The procedure for the correct use of a separator is as follows:

After placing the rubber dam (I suggest heavy rubber dam as it will usually control septal seepage without the use of a ligature), select a proper separator, place it in position and tighten it just enough to prevent any movement. Finish the cavity preparation, and build up the foil, banking it lightly against the adjacent tooth. After condensation has been completed, merely tighten the separator just enough for a matrix band to be maneuvered between the foil and the adjacent tooth. This will allow sufficient room for the introduction of a fine lubricated sandpaper strip. Then the operator can quickly sand off the contact surface of the filling. The remainder of the filling can be finished quickly with files, disks and knives.

Then, release the separator, and test the contact with floss. If the contact is too tight, merely reapply the separator and tighten it just enough for the introduction of another lubricated strip of sandpaper. Draw the strip over the contact surface two or three more times. This is a good time to polish the gingival margin thoroughly with a very narrow strip. After the removal of the separator and another test with floss, the operator usually finds that the contact is adjusted correctly. The floss can now be passed over and through the contact area and into the gingival region for an indefinite period of time without any fraying. The operator has then restored the tooth to its true physiological function. He has prevented food impaction from destroying tissue because he has restored normal contact.

2552 Brownsville Road

JULY 1958

THE Journal OF THE AMERICAN DENTAL ASSOCIATION

LON W. MORREY, D.D.S., EDITOR
VOLUME 57 • NUMBER 1
Published by the American Dental Association
222 East Superior Street • Chicago 11, Illinois

Editorials

World Health Organization observes its first decade of service

Last month the World Health Organization, meeting in Minneapolis, observed its tenth anniversary. During the short decade since WHO was founded it has included, among many accomplishments of which it may be proud, inroads on dental disease.

Since its inception, WHO has played a major role in the eradication of malaria in several large geographical areas including Italy, French Guiana and Puerto Rico.[1] Its agents, armed with penicillin and other potent weapons, have waged unceasing war against tuberculosis, yaws, trachoma and leprosy. It has established a world-wide intelligence service for the detection of epidemics and has made progress in setting international standards for drugs and health regulations, and, among other things, it has provided fellowships to train more than 5,000 public health workers in approximately 70 countries.

Most human disorders, including dental disorders, have been at least touched by this young and vigorous organization. Dentists, of course, would like to see more of its activities and resources turned toward dental problems and their solution. At present WHO's official dental staff consists of but two dentist consultants—one for the eastern hemisphere and one for the western. Their principal duties are to advise governmental health agencies regarding the status of public dental health and to recommend preventive dental health programs. Such counseling service, although necessarily limited, has already proved its worth in many areas, particularly in those areas that have the means but not the know-how.

Of even greater import to world dental health, however, was the action of WHO last August approving water fluoridation. In so doing WHO aligned itself with the growing assembly of authoritative health agencies which are aiding communities to adopt this simple but effective anticariogenic measure in the best interest of their children.

THE JOURNAL joins with all other agencies interested in improving world health standards in hoping that the achievements of the World Health Organization, during its first decade of life, foreshadow its accomplishments in the future. Additionally, it is hoped that the facts reported at the Minneapolis meeting and the inspiration engendered there will determine the international delegates to increase even further their efforts to attain the goals set forth in the WHO charter.

1. Ten years of WHO. Scient. Amer. 198:46 June 1958.

Plagiarism: it has no place in modern dental journalism

Recently two unfortunate charges of plagiarism caused considerable consternation in certain segments of the dental journalistic world.

In one instance a dentist whose article concerning a specific phase of therapeutics was published in the JOURNAL OF ORAL SURGERY a few years ago charged that the author of an article subsequently published on the same subject in another journal appropriated, without giving credit, several sections of the original material. The accused dentist naturally denied the accusation vigorously and there resulted a long correspondence between the two authors, the editors and others involved but as yet the incident has not been resolved satisfactorily. All that has resulted to date is a vast expenditure of words, time and temper.

In the second instance the author of an article on office technic which was published in THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION a few years ago charged that certain pertinent observations and conclusions which were original in his paper were purloined and presented in another article on the same subject which was subsequently published in THE JOURNAL. As in the first instance the accused dentist denies the accusation and stoutly maintains his innocence. In both instances the questioned material does show a strong, if not strange, similarity. Whether that similarity came about wittingly or unwittingly probably will never be answered to everyone's complete satisfaction.

THE JOURNAL has no intention of sitting as Solomon on these cases. Since, however, plagiarism in some form does occasionally creep into dental literature and since, even in its mildest form, it is degrading, THE JOURNAL would be remiss if it did not call such indiscretions to the attention of contributors in an effort to raise the standards of dental journalism.

Plagiary, Webster advises, was once a synonym for kidnapping. Although that definition no longer holds, plagiarism is still a refined term for literary theft. In all

fairness it must be recognized that in many instances the plagiarist does not perpetrate the crime deliberately. More often the author commits it unconsciously. "An honest author," says Margaret Nicholson,[1] "knows if he is deliberately copying the words, expressions or thoughts of someone else. His danger is in unconscious plagiarism. Perhaps this plot that he thought up last night . . . is an almost verbatim duplication of a yarn he read . . . several years ago, and hasn't thought of since. . . . The intention to infringe is not essential to infringement. It is the author's responsibility to be sure his work is his own."

Few dentists today would present a clinic or a technic that had been developed by a fellow dentist without giving his confrere full credit. The same standard holds for the printed word. No author can injure anyone by giving credit where credit is due, but he can injure himself irreparably by failing to do so.

Another type of plagiarism, which fortunately is growing less frequent each year, is that of self-plagiarism. Formerly this type of plagiarism was quite common but it is no longer condoned. An author would submit an article for simultaneous publication in a number of different journals in the same or different languages. Or he would repeatedly submit for publication the same article, usually with slightly varied title, in the same or different journals, without advising the editors of its previous publication. This type of plagiarism causes serious trouble for editors, abstracters, researchers, bibliographers, librarians and indexers. Perhaps in the early days there was some excuse for this procedure when dental journalism and dental indexing was less professional and less proficient. Today it leads only to confusion and to the accusation that the author is guilty of self-aggrandizement.

With the increasing number of good, sound, scientific and technical articles being written on various aspects of an expanding profession and with the limited number of publications available, plagiarism in any of its various forms is totally unwarranted.

1. Nicholson, Margaret. A manual of copyright practice. New York, Oxford University Press, 1945.

Dentists and book dealers: joint promoters of books

A suggestion has recently been offered by one of America's better known bookmen that the American Dental Association join forces with the American Publishers Council to help promote reading. Specifically the suggestion is made that the dentist, when occasion permits, turn the conversation to books and discuss with his patients some of his most recent reading which he has found interesting and valuable.

L. L. Day, editor-at-large of Doubleday and Company, who made the suggestion, got the idea while seated in the operating chair of his family dentist—a bibliophile of amateur order. During the course of the operation the dentist turned, for Mr. Day, what might have been a tedious hour into an interesting excursion through the pages of a fascinating and worthwhile book.

Many a joke has been made and many a wise word spoken about the dental patient being a captive audience. No one knows the truth of that situation better than the dentist. Therefore, why not turn the situation and Mr. Day's suggestion into intellectual profit for both patient and dentist?

Although the movies, the radio and the television for a time seemed to threaten America's reading habits, the threat is disappearing and interest in good books is rapidly returning. Each year finds more and more people, including more dentists, turning to books for entertainment, relaxation, mental stimulation and intellectual development. "The intellect is a dioecious plant and books are the bees which carry the quickening pollen from one to another mind."[1]

Bookman Day's suggestion is far from impractical even though all dentists will not be able to sell all patients on the wealth to be found in reading. If, however, a representative number of dentists and bookmen would put the plan into practice, eventually posterity, both mentally and dentally, would profit.

1. Lowell, James Russell.

International Correspondence

NEWS FROM GREAT BRITAIN

In the May 6 issue of the *British Dental Journal* there is an editorial on "Occupational Mortality" which because of its importance to all practicing dentists is worth quoting. The editorial reads as follows:

"For many years it has been known that dentists occupy an unenviable position in the death-rate tables of professions, and the Registrar-General's recently published Decennial Supplement, 'Occupational Mortality,' shows that the position remains substantially the same.

"For the age group 45/54 the death-rate for dentists is well above that of any other profession, and for the 55/64 group it ties with another group for second place among the professions. Volume 1 of the Commentary states, on page 132, 'Dental practitioners had average mortality during 1949-53. There were 125 deaths assigned to coronary thrombosis and 90 expected, giving a significant excess. The only other cause of death for which there was significantly high mortality was suicide (27 deaths registered, 10 expected). There were only 11 deaths assigned to bronchitis with 41 expected.'

"Comparison with the analysis of the 1931 census shows that the position has not changed materially and, therefore, that in neither case are the figures due to chance. . . .

"It might be expected that the most important occupational risks of dentistry would be pulmonary disease and septic infection, but it seems that though these may be experienced they are not often fatal. The inescapable facts are that dentists still head the professional death-rate table during years which, in most professions, would be looked upon as the prime of life, and also that deaths of dentists are frequently attributable to causes such as thrombosis and suicide, which have among their origins continuous overwork and nervous strain.

"There is no question that the strain placed upon the dentist has been increased by the establishment of the Health Service, and it is reasonable to suppose that by the next census this will have been operative for a sufficient length of time for its effects to be shown in the statistics. . . .

"Viewed solely from the interests of the public, it is becoming increasingly evident that there is no wisdom in endeavoring to buy Health Service dentistry cheaply. This is understood by both the Teviot and the Spens Committees. A professional man's best years, when his experience and his diagnostic ability are not likely to be surpassed, probably begin in his late 40's, but that is the time when his physical stamina may start to decline. If he then is compelled to continue to work long hours in order to maintain his standard of living he subjects himself to grave risks. The unfortunate consequences of these risks affect not only the dentist but also the Health Service because, as has been said both inside and outside Parliament, there are not enough dentists to provide a full service for the nation.

"The Minister of Health should, therefore, have at heart the health of dental practitioners for the sake of those they treat, and it is to be hoped that an appreciation of this will be reflected in future conditions of service and scales of remuneration so as to avoid the loss of dentists by early death."

SUBSCRIPTIONS

It was agreed at a meeting of the Representative Board held on April 26 that an extraordinary general meeting of members be called in October for the purpose of considering and, if thought fit, approving new rates of annual subscription to the British Dental Association to come into effect on January 1, 1959. The proposals would increase the present full rate of subscription from six guineas to nine guineas, with appropriate changes in other categories.

CAVITY PREPARATION

E. B. Manley, the well-known scientist and research worker, wrote a very significant letter on cavity preparation which appears in the May 6 issue of the *British Dental Journal*. He comments on the use of low engine speeds as being perhaps a better method than the current high speed vogue. Part of his letter is as follows:

"The use of sharp burs in a reducing handpiece is more acceptable on biological grounds. Excessive heat production is eliminated and the more indeterminate factor of trauma is reduced to a minimum. Patients appreciate

the absence of noise and vibration and, with few exceptions, pain can be reduced to negligible proportions without the use of local anesthesia. . . .

"The modern 'time saving' conception of cavity preparation with high speed drilling using tungsten carbide burs or diamond instruments introduces the destructive factor of excessive heat production. Counter measures of safety have to be introduced. Steps must be taken to reduce heat production by the use of cold water spray or other similar techniques. In addition, the use of local anesthesia is frequently required. Is this modern conception, together with the essential counter measures and injections of local anesthetic, as great a saving of time as is supposed? The results of recent histological investigations into the effect on the pulp of high speed drilling clearly indicate the dangers arising from a lack of appreciation of biological principles. We should do well to pause and ponder on these things with the hope that pondering on biological principles will not be regarded as loitering."

PARLIAMENT

The Minister of Health gave the following figures relating to the increase in the cost of the National Health Service since 1949-1950. He said that, allowing for changes in the value of money, the real increase in the cost of the service since then had been 80 million pounds a year. Much of this increase was accounted for by more extensive service. For example, in the hospitals the number of occupied beds had increased from 453,000 to 478,000, and the number of outpatients had increased from 31,000,000 to 35,000,000.

The number of general medical practitioners in practice had risen from 20,500 to nearly 22,500, and the number of courses of dental treatment provided had increased from 9½ million in 1953 to 12 million in 1956.

An analysis of the estimate for 1958-1959 showed that the dental service took just under 7 per cent of the total expenditure, general medical services just over 10 per cent and hospital running costs nearly 54 per cent.

The Minister has also said that it was estimated that by July 5, 1958, there would be about 1,500 dentists in general practice who would have reached age 60 or more and who would be entitled to retire on pension.

It was announced by the Chancellor of the Exchequer that the government had given authority for university building projects to be started up to a value of 15 million pounds a year for the four years 1960 to 1963.

NATIONAL HEALTH SERVICE

The Minister of Health, addressing the annual conference of local dental committees, said, "The shortage of dentists underlined the paramount importance of preventive measures. . . . These measures included fluoridation of water supplies which were deficient in natural fluorides." From dental examinations carried out in the test areas before fluoridation started, figures showed that children entering school already had an average of six of their deciduous teeth decayed or missing, whilst children aged 14 had seven of their permanent teeth decayed or missing. These figures related to examinations on no less than 12,000 children and spoke for themselves.

"I attach great importance to these demonstrations in the context of the future dental health of the nation," said the Minister. "We are grateful to the profession for its unstinted encouragement and support in the face of some very vocal prejudice against this preventive measure."

He said that, despite the fact that the number of dentists fell short of the nation's needs, the amount of treatment given under the National Health Service continued to rise. Over nine million full courses of treatment were given in 1957, which represented an increase over 1956 of more than 5 per cent. In addition, emergency treatment was given to over two million persons.

ITEMS OF INTEREST

The Hebrew University of Jerusalem has invited Dr. Kerr McNeil to their dental school during May 1958 to teach his methods of closing clefts of the palate by stimulating growth of the palatal tissues to replace surgical treatment.

A most successful annual clinical meeting was held on May 16 at the Eastman Dental Hospital by the British Society of Periodontology. The program included six table demonstrations and many case reports of clinical interest.

G. H. Leatherman,
D.M.D., F.D.S., R.C.S., F.A.C.D.

News of Dentistry

SENATE COMMITTEE RECOMMENDS MONEY FOR NIDR BUILDING, INCREASED GRANTS; TWO TESTIFY OPPOSING FORAND PROPOSAL

As THE JOURNAL went to press word was received from Washington of the recommendation of the Senate Appropriations Committee concerning the construction of a building for the National Institute of Dental Research, and funds for other dental health activities.

Senator Hill submitted to the Senate the committee's report recommending the appropriation of $3,700,000, the amount already approved by the House, for the construction of the building.

Further good news for the dental profession was the fact that the committee recommended an appropriation of $7,923,000 for dental health activities, an increase of $1,380,000 over last year's appropriation. The Association had requested an increase of $750,000 over the $6,543,000 which had been approved by the House.

The additional funds will be used for additional grants for dental research projects.

Forand Bill • Opposition to the so-called Forand bill before the House Ways and Means Committee was offered in testimony June 27 by Matthew Besdine, member of the Council on Legislation, and Rudolph Friedrich, secretary, Council on Dental Health.

The Board of Trustees of the American Dental Association has stated that "the plan for providing personal health care benefits to O.A.S.I. beneficiaries within the Forand proposal and similar bills is in conflict with the Association's principles governing federal support of personal health care programs. . . ."

This principle was applied in testimony before the Congressional Committee by Dr. Besdine and Dr. Friedrich. Representatives of the American Medical Association and the American Hospital Association also testified in opposition to the Forand bill on the final day of the public hearings.

Health Research Facilities Act • An extension of the Health Research Facilities Act has been proposed in identical bills introduced by Rep. Williams (D., Miss.), chairman of the Health and Science Subcommittee of the House Committee on Interstate and Foreign Commerce, and Congressman Roberts (D., Ala.).

The bills would leave in effect the existing $30,000,000 annual grants-in-aid, 50 per cent matching provisions, but would allow the funds to be applied against the total cost of constructing combined research and teaching facilities in instances where the National Advisory Council on Health Research Facilities and the Surgeon General "find that the principal contemplated use of such multi-purpose facilities will substantially further research in the sciences related to health."

Under existing law grants-in-aid funds are available only for research facilities.

Hygienists Are Employees • The Internal Revenue Service has ruled that a dental hygienist is an employee of the dentist, for federal tax purposes, even when circumstances would indicate she is an independent contractor.

The ruling was applied in the case of a hygienist who worked one or two days weekly in the dentist's office, receiving 50 per cent of the fee charged. With-

holding and unemployment tax requirements were held applicable in this and similar cases.

Rhode Island Governor Vetoes Enabling Act • In a surprise action May 25 the governor of Rhode Island vetoed, because it contained technical errors, an Enabling Act which would permit the establishment of a dental service corporation in the state. The measure will be re-introduced at the next session of the state legislature by the Rhode Island State Dental Society, according to Hubert A. McGuirl, secretary.

Fluoridation Referendum • The Massachusetts legislature passed and the governor signed a bill to require communities to submit the question of fluoridation of water supplies to referendum. Efforts by opponents of fluoridation to gain this end have failed in the states of New York and Illinois.

Association Affairs

STATE SECRETARIES HEAR TALKS ON SURVEY, CENTENNIAL

Plans for vigorous participation in the 1959 centennial year observance of the Association at state society levels, and a briefing on the upcoming two-year survey of dentistry were highlights of the Tenth Annual State Secretaries' Management Conference. The sessions were held June 9-11 at Association headquarters in Chicago.

The meetings were attended by representatives of 36 constituent societies, the College of Dental Surgeons of British Columbia, the American Dental Hygienists' Association and the American Dental Assistants Association.

Also of great interest to the more than 50 participants in the conference were discussions of the Forand Bill and Medicare, as well as the responsibilities of state society administration. In his remarks as opening speaker, Rudolph H. Friedrich, secretary, Council on Dental Health, said:

"These two programs accentuate the need for a clear understanding of the policies of the organized dental profession as they apply to the activities of the government in providing health care for various segments of the population."

Hal M. Christensen, assistant secretary, Council on Legislation, explained the reasons for the Association's stand in opposing the Forand proposal but not the Medicare program:

> Briefly, the Association's position is that the federal government should not undertake to provide health care for segments of the American population in the absence of a special relationship, a special responsibility, or a demonstration of economic need. In the case of Medicare the Association has recognized the right of the government, as an employer, to purchase family health care services from private sources as a benefit of employment, and on that basis the program can be justified. The Association has taken the position that it is the dental profession's responsibility in such programs to assure the highest quality of dental service, the freedom of the dentist to perform his professional duties and the right of the patient to seek care of his own choice.
>
> However, the Association does not recognize any special justification for providing federally financed health care benefits for all O.A.S.I. beneficiaries as contemplated in the Forand proposal. With regard to O.A.S.I. beneficiaries, as a class, the government bears no special responsibility, has no special relationship and to date there is no proof that all of them are unable to finance their own health care. If there are large numbers of aged persons who are unable to finance their own health care because of economic reasons, other programs such as public assistance should be expanded to help them, but this should be the outside limit of direct government sponsorship.
>
> In order to meet the arguments of those

who contend that the national health problem can only be solved under the aegis of the federal government, the initiative of state and component dental societies is particularly important. It is clear that deficiencies in the availability of dental care must be detected and remedied at the community and state levels. Otherwise the threat of federally regimented dentistry will remain, unabated.

TWO-YEAR SURVEY

As outlined by Byron S. Hollinshead, Ph.D., director of the Commission on the Survey of Dentistry, the general plan of work will be one large publication made up of the following broad subdivisions of interest: dental education, dental research, dental practice, dental health and socioeconomic studies. The material on the first four of these subjects will undoubtedly be published as separate monographs.

Also under consideration is the publication of a digest of the material for the general public.

ADMINISTRATION AIDS

The structure and administration of the state society office was analyzed by Harold Hillenbrand, Association secretary, who emphasized that the cure for bad administration is better administration, not no administration. He subdivided the secretary's duties into four areas: housekeeping, finances, publications and program, which includes both internal and external programs, and recommended the development of manuals for the instruction of members, and greater participation on the part of the state secretary in allocation of publication funds.

In a recommendation for the use of outside help when faced with problems, Dr. Hillenbrand said, "Most of those charged with the administration of a dental society, with the exception of many executive secretaries, have had no formal training in administration and they conduct their programs with a great deal of energy and devotion but often without a real insight into the technical problems they are facing. This is the point at which professional help is needed. No state society and no secretary should have any objection to the use of management consultants for the study of some or all of the problems in a state society office."

YEAR OF OBSERVANCE

The conferees were told that the success of the year-long centennial celebration of the Association and its impact on the public consciousness rested largely in their hands by Peter C. Goulding, secretary, Centennial Staff Committee. He suggested that constituent and component societies begin planning immediately for centennial events at the state and local levels.

Some of the centennial projects proposed for dental societies include a centennial civic luncheon on February 9, 1959, during national Children's Dental Health Week, a centennial issue of the society's journal, a centennial banquet at the state society annual meeting to honor individuals in the state who have made outstanding contributions to dentistry. In addition, Mr. Goulding urged the society officials to encourage participation by members of the affiliated groups and by associations in allied health fields. Booklets outlining program suggestions have been sent to all societies and later this year special publicity kits will be sent to all centennial chairmen.

The current economic outlook was summarized by Richard H. Samuels, investment counselor for the Association, and Dr. Shailer Peterson, secretary, Council on Dental Education, spoke on the state society's responsibility in the training of dental laboratory technicians.

At the final session of the conference, Ray Cobaugh, executive secretary, Pennsylvania Dental Association, presided over a panel of many of the directors of

Representatives of 36 constituent societies and three other dental organizations were among the participants in the Tenth State Secretaries' Management Conference. The three-day meeting was held at the Central Office in mid-June

the Bureaus and secretaries of the Councils of the Association. Their programs were examined in terms of meeting present and future needs of constituent and component dental societies.

TECHNICIANS BOARD'S BYLAWS APPROVED BY A.D.A. COUNCIL

The bylaws of the National Board for Certification of dental laboratory technicians were approved by the Council on Dental Education in May as being in keeping with the basic requirements stated in the resolution adopted by the American Dental Association's House of Delegates in Miami.

The National Association of Dental Laboratories, of which the Board is an agency, announced that certifying examinations will be given in at least three cities in October for those who are eligible under waiver.

At its meeting May 25 and 26 at the Lake Shore Club in Chicago, the certification board also approved the issuance of founders' certificates to the seven original members of the Board. These members are Horace J. Denner, Joseph Deurmyer, Joseph Kennedy, George Klein, Einar Lignell, Alfred Stern and G. Paul Stough.

The Board announced plans to furnish review material on the history, ethics and jurisprudence of the dental laboratory industry to all candidates for examination.

NEW JERSEY SUPREME COURT REFUSES APPEAL BY MICK

The Supreme Court of New Jersey has refused to review an Appellate Court decision sustaining the dismissal of a libel suit brought by Robert J. H. Mick of Laurel Springs, N. J., against the American Dental Association.

Dr. Mick, who opposes fluoridation of public water supplies, charged that he was libeled by a letter written by Herbert B. Bain, director of the Association's Bureau of Public Information, and by

certain articles published in THE JOURNAL. Mr. Bain and Lon W. Morrey, editor of the American Dental Association, were named as defendants in the suit with the American Dental Association.

The case was dismissed by the New Jersey Superior Court in Camden last year. Dr. Mick subsequently appealed to the Court of Appeals of New Jersey, which sustained the dismissal of the lower court in a decision this spring.

HOSPITAL DENTAL SERVICES ARE CONSIDERED AT INSTITUTE

The status of the dentist on the hospital staff and the expansion of the dental program in the hospital to include restorative, prosthetic and preventive procedures were among the topics discussed at the Second Institute on Hospital Dentistry, which was held June 2-5 at the Edgewater Beach hotel in Chicago.

Fifty-five dentists, including 36 chiefs of dental services and seven chiefs of oral surgery departments, were among those attending the Institute, according to Gerard J. Casey, secretary of the Council on Hospital Dental Service of the American Dental Association.

The Institute was sponsored jointly by the American Dental Association, the American Hospital Association and the American Medical Association.

It was stressed that the dentist who is a member of the hospital staff should be chosen on the same basis and accorded the same professional privilege as the physician on the staff. The dentist should consider his position with the hospital a privilege and not a right, and he should recognize his responsibility to attend staff meetings and clinicopathological conferences as well as dental department meetings.

At present the largest part of the dental service provided in hospitals is in the field of oral surgery. The expansion of the programs of dental departments to include prosthetic, restorative and preventive procedures as the needs of the community indicate was also discussed. Stress was given to the dentist's need for research facilities in basic science as well as in clinical areas.

COUNCIL REVIEWS PROGRAMS IN HYGIENE, DENTAL SCHOOLS

Accreditation of dental schools and schools of dental hygiene, approval of education programs in hospitals and the development of standards for the training of dental assistants were among the major topics considered by the Council on Dental Education at its meeting May 21-24 at the Central Office.

The Council considered the accreditation status of nine dental schools. The University of Texas Dental Branch in Houston was raised from provisional approval to full approval. A complete list of the approved dental schools and schools of dental hygiene will be published in early issues of THE JOURNAL, said Dr. Shailer Peterson, secretary of the Council.

The Council approved educational programs in 30 additional hospitals, thus bringing the number of hospitals conducting training programs approved by the Association to 211. The programs which were approved at the meeting include 17 internships and 16 residencies, which will allow for the training of about 45 dentists.

Also, the Council reviewed a plan for periodic reinspection of programs that have already been approved. Such reevaluation is important to assure continued high quality of the programs, according to Harold W. Oppice, Council chairman.

Training programs for dental assistants were discussed. The decision was reached that additional studies would be needed before educational standards for

dental assistants training could be submitted to the House of Delegates for approval. The Council, however, expressed the opinion that post-high school training might be best but that courses in high schools on an experimental basis should not be discouraged.

A mechanism was approved to carry out the recommendation of the House of Delegates that the American Board of Prosthodontics assume responsibility for the examination and certification of specialists in the broad field of prosthodontics. A meeting of representatives of additional groups seeking recognition as specialties is to be held by the Council within the next few months.

LONG-DISTANCE T.V. CLINICS TO BE FIRST AT A.D.A. MEETING

For the first time at an annual session of the Association, the closed-circuit television clinics to be presented at Dallas will be transmitted over long-distance lines. The full day of clinics on November 11 will be sponsored by E. R. Squibb & Sons and will originate at the University of Texas Dental Branch in Houston.

The program, which will feature procedures performed on live patients and, in one instance, a live dog, has been arranged by John V. Olson, dean at the Dental Branch.

According to David J. Fitzgibbon, chairman of the Council on Scientific Session, the subjects of the television clinics will be "Anatomical Landmarks in the Edentulous Patient as Related to Impressions," "Surgical Treatment of the Periodontal Pocket," "Tracheotomy Procedures," which will be demonstrated on a dog, "Periapical Surgery," "Use of High Speed in the Preparation of a Tooth for Alloy Restoration Including the Insertion of the Alloy" and "Preparation of Bridge Abutments by High Speed and Use of Rubber-Base Impression Materials in Fixed Prosthodontics."

Luzerne G. Jordan of Washington, D. C., will moderate the one day forum on partial denture construction on November 10. Subjects will include "Preliminary Study of Diagnosis," "Mouth Preparation," "Final Impressions and Master Casts," "Final Survey and Design—Clasp Partial," "Final Survey and Design—Precision Attachments," and "Prescription for the Dental Laboratory Technician."

Panel participants will include Alvin H. Grunewald of Chicago, Col. Marion L. Mills of Washington, D. C., Chester Perry of Ypsilanti, Mich., Capt. Frank M. Kyes of Annapolis, Md., I. Franklin Miller of New York and Stanley G. Standard of New York.

Vertical dimension and centric relation are to be the topics of a one day forum on November 12. During the morning session, panel participants will talk on "Some Physiologic Considerations of Centric and Other Jaw Relations," "A Cephalometric Study of the Clinical Rest Position" and "A Clinical Study of True Centric and Functional Centric."

J. Eugene Ziegler of Los Angeles will be moderator, with R. H. Kingery of Ann Arbor, Mich., Ralph H. Boos of Minneapolis and Morris J. Thompson of Beverly Hills, Calif., as discussers.

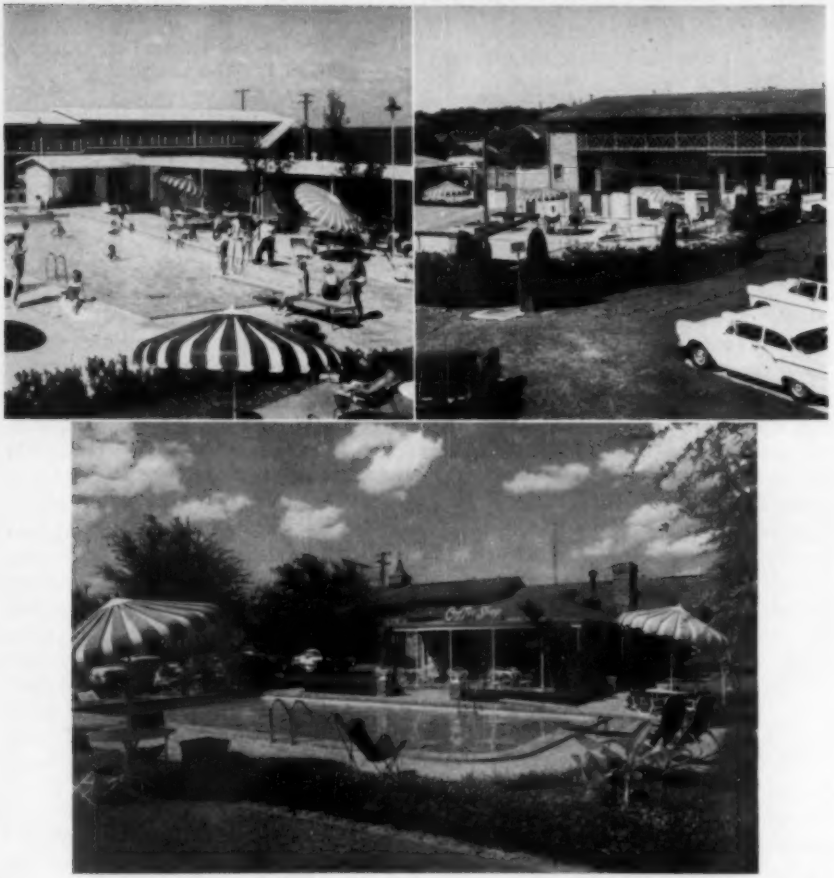
The afternoon panel discussion will be on "Methods of Obtaining Vertical Dimension and Centric Relation," with short talks on phonetics, the bimeter, occlusal plane and on evaluation of the various methods.

Panel participants will include Robert E. Moyers of Ann Arbor, Douglas A. Atwood of Boston, George A. Hughes of San Francisco, M. L. Morrison of Riverside, Calif., Ralph H. Boos of Minneapolis and LeRoy E. Kurth of Chicago.

Two panelists and the moderator of the afternoon panel will be announced later.

On the afternoon of November 10

MOTEL ACCOMMODATIONS IN DALLAS OFFER CONVENIENCE FOR DRIVERS TO ANNUAL SESSION



Motels offer convenience for those who plan to drive to the 99th annual session of the American Dental Association in Dallas November 10-13. Pictured are three of the 22 motels which have agreed to accept reservations. All these motels are on main routes into Dallas. Reservations for both hotels and motels must be made through the A.D.A. Housing Bureau. An application form for housing accommodations appears on page A-14 of this issue.

rubber-base impression materials will be the topic of a panel discussion, with Roger E. Sturdevant of Chapel Hill, N. C., as moderator. Ralph W. Phillips, Ph.D., of Indianapolis, Clifford M. Sturdevant of Chapel Hill, N. C., and Robert F. Eastman of New Orleans will appear on the panel.

THREE HONORARY DEGREES CONFERRED ON ALSTADT

William R. Alstadt, president of the American Dental Association, recently received three honorary degrees.

Dr. Alstadt was the first person to receive an honorary Doctor of Science degree in the 29 year history of the University of Kansas City. The award was made during the university's commencement ceremonies on June 1.

During his tour of the Far East in the spring, Dr. Alstadt received honorary D.D.S. degrees from two Japanese dental schools. Nihon University School of Dentistry in Tokyo awarded him a degree on April 3 and Tokyo Dental College on April 4.

COUNCIL ON HOSPITAL SERVICE MAKES LONG-RANGE PLANS

The Council on Hospital Dental Services, which met June 6 and 7 at the Central Office, marked expanded communication with councils on hospital dental service and with other health professions as the areas of the Council's program which should be expanded in the future.

According to H. Cline Fixott, Jr., Council chairman, the Council, in regard to the accreditation program for hospital dental services, is actively cooperating with the American Hospital Association

William R. Alstadt, president of the American Dental Association, received an honorary Doctor of Science degree from the University of Kansas City June 1. Dr. Alstadt was the recipient of the first honorary degree in science to be awarded by the university. Those participating in the ceremony were (l. to r.) John M. Clayton, university trustee; Dr. Richard M. Drake, chancellor of the university, who conferred the degree; Dr. Alstadt; and Joseph F. Jacobs, acting dean, Kansas City-Western Dental College of the University of Kansas City

and the Joint Commission on the Accreditation of Hospitals in seeking solutions to the problems of organization and administration of the hospital dental service.

Dental services have been established in 2,241 of the 6,966 hospitals in the United States. Of these, 462 dental programs in hospitals have been approved as meeting the standards established by the Council.

HONORARY DEGREE CONFERRED ON HILLENBRAND BY LOYOLA

Harold Hillenbrand, secretary of the American Dental Association, received an honorary doctorate in science from his alma mater, Loyola University of Chicago, at the university's commencement ceremonies June 11. Dr. Hillenbrand also delivered the commencement address.

A graduate of Loyola University's School of Dentistry, which is celebrating its diamond anniversary this year, Dr. Hillenbrand also served on the faculty of the dental school for many years.

The citation commented on his contributions to dental journalism. "But not only on the local or state or national level has his influence been felt," the citation continued. "His philosophy, which concerns itself not only with technical efficiency, but which without ceasing advocates a sense of moral and social responsibility in his profession, and to the public weal, has been recognized throughout the world."

DENTISTS ASKED TO ALERT LABORATORIES ABOUT SURVEY

A survey of the dental laboratory industry is to be conducted by the Council on Dental Trade and Laboratory Relations and the Bureau of Economic Research and Statistics of the Association. Questionnaires are to be mailed in late July to approximately 6,500 dental laboratories throughout the United States.

Dentists are asked to alert the owners of the dental laboratories with which they do business that the survey is to be made, said Bernard J. Beazley, secretary of the Council. The survey was authorized by a 1957 resolution of the House of Delegates.

Representatives of the National Association of Dental Laboratories are assisting in the preparation of the questionnaire.

ALSTADT ENDORSES PROGRAM OF HERITAGE FOUNDATION

William R. Alstadt, Association president, has endorsed the nonpartisan campaign of the American Heritage Foundation to encourage each citizen to give financial support to the party and candidates of his choice during the 1958 election campaign.

In a letter to John C. Cornelius, president of the Foundation, Dr. Alstadt said "To the extent that we can increase the personal participation of each citizen by encouraging him to vote and to be interested actively in the 1958 election campaign, . . . we are strengthening our democratic institutions. It must be remembered that 'the man who takes no part in politics is governed by the man who does.'"

COUNCIL REQUESTS REPORTS OF ANY ABUSE OF F.T.C. RULES

Constituent societies are urged by Bernard J. Beazley, secretary of the Council on Dental Trade and Laboratory Relations, to inform the Council of any apparent abuses of the amended *Trade Practice Rules for the Commercial Dental Laboratory Industry,* in accordance with the resolution passed by the 1957 House of Delegates.

The Council also calls attention to the 1957 resolution of the House of Delegates which states the Association's opposition

"to the direct promotion to the public of any equipment, dental materials or any other product, the selection of which is exclusively the dentist's responsibility." Information on any direct promotion to the public should be sent to the Council at the Central Office, Mr. Beazley said.

THREE DENTISTS NAMED TO EMERGENCY CARE TASK FORCES

Phelps J. Murphey of Dallas, John G. Carr of Camden, N. J., and John E. Chrietzberg of Atlanta, Ga., have been named representatives of the American Dental Association on the task forces of the Commission on National Emergency Medical Care. The first meetings of the task forces were held in early June.

The Commission operates under a contract between the federal Civil Defense Administration and the American Medical Association. The Commission is to study and develop plans for the management of the medical problems that would arise as a result of a nuclear attack.

Dr. Murphey and Dr. Carr, both consultants to the Council on Federal Dental Services, will serve on the task forces on emergency medical care and on organization, respectively.

Dr. Chrietzberg, Georgia state dental director, will serve on the task force on personnel training and utilization.

Several key organizations in the health field are represented on the task forces.

ARMY, NAVY CASUALTY COURSES OPEN TO DENTISTS

Representatives of the American Dental Association will be permitted to receive training in casualty treatment through courses that have been scheduled by both the Army and the Navy.

The Army will give courses in "Management of Mass Casualties" September 15-20 and February 16-21, 1959, at Walter Reed Army Institute of Research in Washington, D. C., and February 9-13, 1959, at the Army Medical Service School at Fort Sam Houston, Texas.

Training courses in casualty treatment are to be given at the Great Lakes naval training center near Chicago July 15-31, August 5-21, and August 26-September 11.

Association members who would like to attend one of the courses should write Herbert C. Lassiter, secretary of the Council on Federal Dental Services, at the Central Office of the Association.

WARREN G. BALL APPOINTED TO CENTRAL OFFICE STAFF

The appointment of Warren G. Ball as assistant secretary of the Council on Dental Education was announced by Association Secretary Harold Hillenbrand as THE JOURNAL went to press. Dr. Ball, who holds degrees in dentistry and hospital administration, will begin work in early July.

MILLER, MEMBER OF COUNCIL ON DENTAL HEALTH, DIES

Donald H. Miller, of Elmira, N. Y., a member of the Council on Dental Health of the Association, died June 8 in Elmira. He was 58 years old.

Dr. Miller served two terms on the Council from 1949 to 1955, and last fall he was appointed to fill a vacancy on the Council until November 1958. He had served as vice-chairman of the Association's Council.

Past-president of the Dental Society of the State of New York, the Sixth District Dental Society and the Elmira Dental Society, Dr. Miller was first chairman of the council on dental health of the state society.

He had been a commissioner of the Elmira Board of Health for many years. He was a graduate of the University of Buffalo School of Dentistry.

NADL JOURNAL REPRINTS REPORT ON LAB GROUP

"The Independent Dental Laboratories Association (an Illinois corporation)," a report of the Council on Dental Trade and Laboratory Relations which appeared in the May issue of THE JOURNAL, was reprinted in the May issue of the *NADL Journal,* the official publication of the National Association of Dental Laboratories.

Walter E. Dundon, chairman of the A.D.A. Council, sent a letter to the *NADL Journal* thanking them for reprinting the report.

A limited number of copies of the report are available from the Council at the Central Office.

REVISED EDITION OF "ATLAS OF MOUTH" TO BE PUBLISHED

Atlas of the Mouth, a popular Association publication which has not been available for two years, has been extensively revised and the new edition will be issued in August, according to Perry J. Sandell, director of the Bureau of Dental Health Education.

The revised edition will contain 20 new plates.

REPORTS ON BUDGET PAYMENT REPRINTED FOR USE AS GUIDE

The reports of the Council on Dental Health concerning budget payment plans, which appeared in the September, October, November and December 1957 and the March 1958 issues of THE JOURNAL have been reprinted in booklet form.

The reprint also contains the symposium on development and operation of budget payment plans which appeared in the February 1958 issue of THE JOURNAL. The reprint constitutes a manual on budget payment plans, according to the Council.

A minimum of 25 copies may be ordered from the Order Department of the Association. The deadline for orders is July 15. Prices are $5 for 25 copies, $9.75 for 50 copies and $19.50 for 100 copies, and prices will be quoted on request for orders of 500 copies or more.

TESTIMONIAL LUNCHEON GIVEN FOR PERCY PHILLIPS

Percy T. Phillips of New York, president-elect of the American Dental Association, was honored at a testimonial luncheon May 14 in Buffalo, during the annual meeting of the Dental Society of the State of New York.

William R. Alstadt, president of the Association, and Edward F. Mimmack of Buffalo, Second District trustee of the American Dental Association, were among those attending.

Dental Societies

BROTHERS HOLD SAME POST IN DENTAL, MEDICAL SOCIETIES

Two brothers from Atlanta, Ga., one a dentist and the other a urologist, are both presidents-elect.

Allen Pierce McDonald was elected to the post in the Fulton County Dental Society, and a short time later his brother, Harold P., was elected to the same office in the Fulton County Medical Society.

CHICAGO SOCIETY ANNOUNCES RESEARCH AWARD COMPETITION

The Chicago Dental Society again is offering its annual prize of $500 for the most meritorious essay concerning an original investigation and containing new and significant material of value to the dental profession.

The competition is open to any person who is a member of the American Dental

Association or a recognized dental society in another country or who is affiliated with a recognized institution in the field of dentistry. The winning essay will be read at the 94th Midwinter Meeting of the society February 8-11, 1959.

Applications to enter the competition must be filed before September 1 with the office of the society, 30 N. Michigan Ave., Chicago 2.

ENNIS IS RECIPIENT OF PENNSYLVANIA AWARD

LeRoy M. Ennis received the annual award of the Pennsylvania Dental Association at the past-presidents dinner May 23 at the Penn Harris hotel in Harrisburg.

Dr. Ennis is a past-president of the Pennsylvania association and a past-president of the American Dental Association, and he was a member of the Board of Trustees of the American Dental Association from 1944 to 1950. He is the author of a textbook on roentgenology and head of the roentgenology department at Thomas W. Evans Museum and Dental Institute of the University of Pennsylvania.

LeRoy M. Ennis

Dr. Ennis served as director of the dental school of Cairo University in 1953,

The North Carolina Dental Society at its annual session in May honored Rear Admiral Ralph W. Malone, chief of the Navy Dental Corps and a native of North Caroline, for his distinguished career in the Navy and his contributions to dentistry in the armed services. Pictured are (l. to r.) Ralph D. Coffey, president of the society; Cecil A. Pless, who delivered the tribute to Admiral Malone; Mrs. Malone; Admiral Malone; and Frank O. Alford, who presented a silver bowl in behalf of the society.

and was in Egypt from 1953 to early 1956.

The award is made to a Pennsylvania dentist "whose public life and activities have been of such nature as to reflect great credit to his profession."

W. B. CALDWELL RECOGNIZED FOR 60 YEARS OF PRACTICE

Wilbur B. Caldwell of Hamilton, Ohio, was honored for his 60 years in the practice of dentistry by the Keely Dental Society of Butler County, Ohio, which passed a resolution recognizing Dr. Caldwell's unusual career.

Dr. Caldwell is a life member of the American Dental Association.

Dental Education

ROBINSON TO HEAD KANSAS CITY DENTAL SCHOOL

Hamilton B. G. Robinson will become dean of Kansas City-Western Dental College of the University of Kansas City on September 1.

He will succeed Joseph F. Jacobs, who has served as acting dean of the school since March 1957 and who has resigned to return to full-time practice.

Dr. Robinson has been associate dean at the College of Dentistry of Ohio State University in Columbus. He is well-known for his contributions to dental research. He resigned this spring as editor of the *Journal of Dental Research*, a post he had held for many years.

FULBRIGHT AWARD AVAILABLE IN DENTISTRY IN SINGAPORE

A Fulbright award may be obtained for lecturing or research in operative dentistry at the University of Malaya in Singapore during the academic year 1959-1960.

Applications must be made by October 1. Additional information and application forms are available from the Conference Board of Associated Research Councils, Committee on International Exchange of Persons, 2101 Constitution Ave., Washington 25, D. C.

REFRESHER COURSES OFFERED ON VARIOUS DENTAL TOPICS

Alabama • On September 20-21, William T. Heron, Ph.D., will conduct a course in hypnosis as applied to dentistry at the University of Alabama School of Dentistry.

The tuition is $100 and the class will be limited.

Further information may be obtained from the director of the refresher course program at the dental school, 1919 Seventh Ave. South, Birmingham.

Emory • Functional oral diagnosis and pedodontics will be the subjects of two courses scheduled for September by Emory University School of Dentistry, Atlanta, Ga.

Charles E. Stuart of Ventura, Calif., will present the course on functional oral diagnosis, which is to be given September 17-19. Tuition is $150.

Earl L. Lampshire, associate professor of pedodontics, University of Nebraska, will be in charge of the course on pedodontics to be given September 22-24. Tuition is $75.

Further information may be obtained from Arthur L. Irons, co-ordinator of continuation study courses at the dental school, 106 Forrest Ave., N. E., Atlanta 3, Ga.

North Carolina • Several courses have been scheduled by the School of Dentistry of the University of North Carolina, Chapel Hill.

Two courses on dentistry for children will be given in July. The first course, which will treat child management and economics, diagnosis, cavity preparation and pulp therapy, will be taught July 7-11. Fixed prostheses, removable prostheses and fractured incisors will be discussed during the second course, July 14-18. Tuition is $100 for each course.

Two courses will be given on rubber impression materials for single and multiple restorations on July 11 and 12 and July 25 and 26. Tuition is $50.

"Long Cone Right Angle X-Ray Technic and Reducing Radiation Hazards" will be the subject of a course to be given August 1 and 2. Tuition will be $50.

A five-day course on basic endodontics will

be given at the dental school August 11-15. The fee is $125.

Further information may be obtained from the office of postgraduate dental instruction of the dental school, Box 750, Chapel Hill, N. C.

Research

THREE APPOINTED TO ADVISORY RESEARCH COUNCIL

Willard C. Fleming, Harold L. Enarson, Ph.D., and R. S. Poor, Ph.D., have been appointed to the National Advisory Dental Research Council for four year terms beginning in October.

Dean of the School of Dentistry of the University of California, Dr. Fleming is a member of the Association's Council on Dental Education and a member of the Commission on the Survey of Dentistry.

Dr. Enarson is executive secretary of the Western Interstate Commission for Higher Education, which has been concerned with dental manpower needs and the extension of training facilities for dentists in the Western states. He has also held teaching positions and served in various capacities with the federal government.

Dr. Poor is provost of the J. Hillis Miller Health Center at the University of Florida. In his position he represents the president of the university in coordinating all units in the health fields.

GIES FOUNDATION MAKES GRANT TO I.A.D.R. FOR JOURNAL

The William J. Gies Foundation for the Advancement of Dentistry, Inc., has made a grant of $3,900 to the International Association for Dental Research. The purpose of the grant is to provide support for the journal of the Association, the *Journal of Dental Research*.

Announcement of the grant was made at the 36th annual meeting of the research association in Detroit.

The money will be used to provide extra pages for papers awaiting publication in the journal in the year 1958. Officials of the association expect the support to be of considerable help in achieving more rapid publication and thus stimulating more interest and work in dental research.

Public Health

P.H.S. RELEASES REPORT ON NATIONAL DENTAL SURVEY

The U.S. Public Health Service has released a preliminary report on dental interviews that were conducted by the Bureau of the Census in connection with the National Health Survey.

The report is entitled *Preliminary Report on Volume of Dental Care, United States, July-September, 1957* (P.H.S. publication 584-B2). It is available for 25 cents from the Superintendent of Documents, Government Printing Office, Washington, D. C.

According to Walter J. Pelton, director of the division of dental resources, dental examinations are presently being made on a few persons in the Washington area to test the methodology for the dental part of the National Health Survey. Dentists in Washington may receive examination data if one of their patients is examined and gives his dentist's name. Dentists throughout the country may receive such forms during a later phase of the survey. The examinations do not include the taking of roentgenograms.

LAY FLUORIDATION COMMITTEE MEETS IN NEW YORK

Hugh R. Jackson, president of the National Social Welfare Assembly, in speaking before the annual meeting of the

Committee to Protect Our Children's Teeth, said that fluoridation was "actually one of the least controversial issues to come before the public in some time."

The annual meeting of the Committee, which is headed by the noted pediatrician Benjamin Spock, was held May 28 in New York.

Mr. Jackson said that the overwhelming majority of expert scientific judgment shows that fluoridation is a safe measure for reducing the incidence of dental caries by about 60 per cent. He also cited the endorsements of fluoridation by the American Dental Association, the American Medical Association and other leading scientific groups.

"Yet the voices of a relatively few people . . .," he said, "have succeeded in creating doubts and fears in the public mind and have created the impression that this is a highly controversial issue."

COLORADO COLLEGE AWARDS MCKAY HONORARY DEGREE

Colorado College in Colorado Springs awarded Frederick S. McKay an honorary Doctor of Science degree June 2 in recognition of his pioneer research on the effect of fluoride on the teeth.

International

DEAN, PINDBORG PARTICIPATE IN WORLD HEALTH ASSEMBLY

H. Trendley Dean, secretary of the Council on Dental Research of the American Dental Association, served as an adviser to the U. S. delegation to the 11th World Health Assembly, which was held from May 26 to June 14 in Minneapolis.

J. Pindborg of Denmark was the only other official dental representative among the delegations from the 85 member nations of the World Health Organization.

Great progress in limiting the prevalence of malaria, yaws, smallpox, leprosy and malnutrition was reported at the Assembly, at which the tenth anniversary of WHO was commemorated.

Carl L. Sebelius, dental health officer for the World Health Organization, reported that the dental activities of WHO included a meeting of an Expert Committee on the Public Health Aspects of Fluoridation in August 1957. The report of the Expert Committee was approved at a meeting of the Executive Board of WHO early in 1958. An epidemiological study of periodontal disease in India was also inaugurated during 1957.

An Expert Committee on the Uses of Auxiliary Dental Personnel is meeting June 30 to July 5 in Geneva, Switzerland. Dr. Shailer Peterson, secretary of the Association's Council on Dental Education, is a member of the Committee.

Delegates to the Assembly were entertained by the American Dental Association, the American Hospital Association, the American College of Surgeons, the American Medical Association and the Joint Commission on the Accreditation of Hospitals at a postassembly reception June 15 in Chicago.

SPECIAL MEETING TO BE HELD IN BRITAIN ON DUES INCREASE

The Representative Board of the British Dental Association will recommend an increase in the association's dues to an Extraordinary General Meeting of members which is to be called for October.

John Gilbert, the honorary treasurer of the association, said that the proposal had been coming for two or three years.

During his visit to Tokyo this spring, William R. Alstadt, American Dental Association president, was honor guest at a party given by the U. S. Armed Forces in Japan. Among those attending were (l. to r.) Col. Howard N. Burgin, chief dental surgeon, U. S. Army in Japan; Capt. Victor A. LeClair, senior dental officer, U. S. Navy Hospital, Yokosuka, Japan; Dr. Alstadt; Kazuo Sato, president, Japan Dental Association; Col. Tsuneo Hosaka, chief dental surgeon, Japan Self-defense Force; and Col. Glynn B. Widner, chief dental surgeon, U. S. Air Force in Japan.

He said the present income was insufficient because of costs over which the Association had no control, such as the necessity of increasing salaries, and the need of the association for an increased income to buy premises or to pay a much increased rent. He also cited the need for funds to meet requests from branches and sections and to keep up the services presently provided for members, as well as to provide for new services.

The full rate would be increased from 6 guineas a year to 9 guineas, with increases for other categories of membership.

ITALIAN SOCIETY TO SPONSOR CONGRESS IN PAVIA

The Congress of the Italian Society of Dentistry and Maxillofacial Surgery will be held September 3-7 at the Dental College of the University of Pavia in Pavia, Italy.

Two symposiums will be the features of the program. "Removable Dentures" will be the subject of one symposium, and "Surgery of the Temporomandibular Joint" will be the subject of the other.

Further information may be obtained from Silvio Palazzi, director, Clinica Odontoiatrica, Universita di Pavia, Pavia, Italy.

GERMAN DENTAL SOCIETY ELECTS HARNDT PRESIDENT

The German Dental Society (Deutsche Gesellschaft für Zahn-, Mund- und Kieferheilkunde) has elected Ewald Harndt president for 1958.

Dr. Harndt is professor of dentistry at the Free University of Berlin.

General

RECORDS OF LABORATORIES SUBPOENAED IN MISSOURI

A number of dental laboratories in Missouri produced their books and records on May 19 on the order of a federal grand jury in Kansas City. In mid-summer of 1957 the records of the Missouri State Dental Association and the Missouri Dental Laboratory Association were subpoenaed by a federal grand jury in Chicago.

KOREAN DENTIST RECEIVES HONORARY LL.D.

Paul Chung, an assistant professor at Northwestern University Dental School, received an honorary Doctor of Laws degree from Illinois Wesleyan University, Bloomington, for work he performed for his native Korea and for his achievements in dental research.

Dr. Chung received his B.D.S. degree from Seoul Dental College and his D.D.S. and M.S.D. degrees from Northwestern. He was active in the dental education and in dental association work in Korea and he served as a public health adviser to the U. S. military government in Korea from 1945 to 1946. He is president of the Korean-American Association.

EDITORIAL BY WALTER HYDE RECEIVES 1957 GIES AWARD

Walter Hyde's editorial, "Throw-aways," which appeared in the July 1957 issue of *North-West Dentistry* has been selected to receive the Gies editorial award, which is made annually by the William J. Gies Foundation for the Advancement of Dentistry.

Dr. Hyde, who is editor of *North-West Dentistry,* will receive a prize of $200 and a plaque.

The Board of Directors of the Foundation stated that one of the purposes for which the Gies Foundation was founded and among Dr. Gies' primary interests was the promotion and aid of nonproprietary dental journalism.

Dentists are invited to submit editorials published in the 1958 volumes of nonproprietary dental journals in the United States and Canada for the 1958 award. Editorials should not exceed 750 words and they should be submitted to John P. Traugott, chairman of the editorial award committee, 121 E. 60th St., New York 22, by February 1, 1959.

TEALL APPOINTED TO OFFICE IN DENTAL EXAMINERS GROUP

Gordon L. Teall of Hiawatha, Kan., has been appointed secretary-treasurer of the American Association of Dental Examiners.

Dr. Teall succeeds the late Carl A. Bumstead in the office.

ASSISTANTS TO INTENSIFY CAMPAIGN FOR MEMBERSHIP

A plan for intensifying the current nationwide membership campaign of the American Dental Assistants Association was activated at a recent meeting of the group's public relations committee, which was held June 12 and 13 at the Central Office of the American Dental Association in Chicago.

A long-range public relations program for the future growth of the assistants association was also considered. Awards for new members and their sponsors, to be granted at the group's meeting in Dallas in November, were also established, according to Mrs. Virginia Hoffman, chairman of the committee.

The Reader Comments

THE JOURNAL *devotes this section to comment by readers on topics of current interest to dentistry. The editor reserves the right to edit all communications to fit available space and requires that all letters be signed. At the request of the author, signatures will be deleted before publication. Printed communications do not necessarily reflect the opinion or official policy of the Association. Your participation in this section is invited.*

The Editor

DIETARY FLUORIDES

This note is in reference to the report of the Council on Dental Therapeutics titled "Prescribing supplements of dietary fluorides" published in Volume 56, April 1958, pages 589-591 of THE JOURNAL.

I have been studying the effects of dietary fluorides for approximately the past 10 years. Your Council knows of this study for they have been in correspondence with me and therefore cannot plead ignorance. In some of the reports published, on this study, results comparable to those found in fluoridated areas have been reported namely, reduction in caries, a more "opalescent" enamel with shallow fissures and grooves, mottling of deciduous teeth and with a 1% incidence of undesirable side effects.

In this study the majority of parents see to it that the conscientious administration of the fluoride supplements to their children under the long periods required in the development of caries resistance in their teeth, namely, the first 8 years of life, is carried on, as with vitamins.

In over 1200 cases I have not encountered a single case of accidental poisoning through overdoseage. Resulting dental fluorosis when it becomes apparent, does so in the same chronological order as do occurrences from any fluoride source namely, after the erruption of the teeth. I cannot see the concern of possible misuse or ineffective use that is raised. I cannot agree with the Council when it suggests that supplementary fluorides be prescribed if the concentration of fluoride ion in the drinking water is 0.7 part per million or less. I do not believe supplementary fluorides should be used when the concentration is 0.5 p.p.m. or higher.

The suggestion that one fluoride tablet containing 2.2 mgm. of sodium fluoride per tablet should be used to each quart of water for drinking purposes and the preparations of formulas and in other foods before 2 years of age, I feel will lead to excessive fluorosis.

The comment on potential hazard resulting from careless or improper administration of excessive amounts of fluorides to young children over a protracted period of time is well taken, but should be considered as a greater possibility with community water as the source —for with supplements one can discontinue the ingestion after the 8th year—which you can't do when the water-tap is the medicine bottle.

The statement "There is increasing evidence that some protection is provided for teeth which erupted prior to the use of fluoride-bearing water"—lends credence to the use of fluoridated mouth washes as being of value.

An easier and more practical method for the use of fluoride solution to supply a mgm. of the fluoride ion per day if fluoridated water is desired as the method, would be to drop a sodium fluoride tablet containing 2.2 mgm. of sodium fluoride into any quantity of water that a child would use in one day for all internal purposes whether it be 4 ounces or whether it be a few quarts and ingest it as desired or needed.

The comment regarding fluoride in the form of calcium fluoride or bone meal has also been reported and discussed in our study, for we have found that calcium fluoride in gastric juices at 37 degrees Centigrade is 50 parts per million soluble, and that I have shown in published reports that the fluoride obtained from calcium fluoride, ionizes and becomes stored in the placenta of a pregnant woman and passes through the placental barrier to the foetal blood supply.

The statements made, in using fluoride solutions fail to take into consideration the quantity of fluoride that would be ingested when the home fluoridated water supply would be used and therefore causes me to voice again the same objection that I have to community fluoridated water, namely the variations in water intake, and so we find that it is impossible to determine which child will receive the correct quantity, which will receive an excessive amount and which will not receive enough.

Reuben Feltman, D.D.S., Passaic, N. J.

RE: "EVALUATION OF KASDENOL (CLORPACTIN)"

The article of S. Leonard Rosenthal entitled "Evaluation of Kasdenol (Clorpactin)" in the May issue of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, is shocking and appalling because its content has been contradicted by voluminous evidence carefully evaluated by foremost clinicians and researchers, not only in dentistry, but in many fields of medicine as well. . . . There have been innumerable publications of their work in various reputable dental and medical journals, including those of the American Medical Association.

All this was available to Dr. Rosenthal who apparently refused to recognize these authorities, and drew his own conclusions based on three cases in a twenty-four hour period and a laboratory technique which refused to follow our recommendation as to the correct technique for testing the germicidal powers of Kasdenol.

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION . . . has a tremendous responsibility, not only to its membership, but to pharmaceutical manufacturers as well, and we feel certain that you would not knowingly condemn a drug as ineffective without due and careful consideration of all the facts, and without presentation of these facts to your members.

Since your publishing of Dr. Rosenthal's article prejudices and jeopardizes our position in the ethical drug field, and contrary to Dr. Rosenthal's intimations, Kasdenol is definitely not a proprietary product, we request that we be granted similar space to that allotted to Dr. Rosenthal for rebuttal so that this additional body of evidence can be placed before the members of the American Dental Association in a scientific manner. . . .

John L. Loesel, Vice-Chairman
Board of Directors
The Kasdenol Corporation

Essentiality of experimental controls in research

Austin H. Kutscher, D.D.S., New York; Neal W. Chilton, D.D.S., M.P.H., Trenton, N. J.; L. Franklin Bumgardner, D.D.S., Charlotte, N. C.; Charles F. Bodecker, D.D.S., Hempstead, N. Y.; Wesley J. Dunn, D.D.S., Toronto, Canada, and Martin Rothman, D.D.S., New Haven, Conn.

A questionnaire was mailed by the Scientific Manuscripts Committee of the American Association of Dental Editors to a representative group of consultants whose opinions were requested on the desirability of formulating and adopting a resolution or principle directed at emphasizing the essentiality of experimental controls in research.

The report had its origin in a disturbing review of the literature by Ross[1] who reported that of 100 unselected consecutive papers appearing in highly respected medical journals, only 27 per cent of the studies reported were well controlled, whereas 45 per cent of the studies were uncontrolled and 18 per cent had inadequate controls; in 10 per cent no controls were possible.

The Ross report also emphasized that the experimental control ". . . is not just a tool of highly specialized teachers or research men" but that men at the grass roots of medical practice and theory ". . . must learn to evaluate various treatments and procedures."

The Ross study demonstrated that, wherever the responsibility lies, the job of rejecting manuscripts for publication which do not include suitable experimental controls is not being carried out thoroughly enough. Thus, the present study was undertaken: (1) to develop the thesis of the essentiality of experimental controls in research; (2) to examine the legitimate possible exceptions from this general principle; (3) to delineate at least some of the reasonably acceptable forms of control procedures; (4) to correlate this material into a message encouraging the proper use of controls in research and discouraging the lack of or inadequate use of controls; (5) to direct this codification of principle to authors, journal readers, consultants, researchers, and editors; and (6) to provide a backbone of opinion which would serve subsequently to support editors and others accorded the unenviable task of approving the submission of manuscripts for publication or for accepting or rejecting these for publication. To this end a resolution (appearing at the conclusion of this report) was drafted and submitted for consideration by a consultant panel and ultimately for consideration by the American Association of Dental Editors.

BACKGROUND INFORMATION

The present study was intended to parallel several studies that are striking examples of the usefulness of the construction of guideposts for research. Reports on these studies have appeared in THE JOURNAL OF THE AMERICAN DENTAL AS-

This report was prepared by the Scientific Manuscripts Committee of the American Association of Dental Editors whose members are the authors of this report. The resolution which resulted from the survey described herein has been approved by the Board of Directors and the membership of the American Association of Dental Editors. This paper was adapted from a presentation read before the American Association of Dental Editors, Miami Beach, Fla., November 2, 1957.

1. Ross, O. B., Jr. Use of controls in medical research. J.A.M.A. 145:72 Jan. 13, 1951.

SOCIATION.[2-5] This program was designed to add one more facet to a developing awareness of the need for the study of research per se, a responsibility of researchers, research administrators, and editors themselves.

That the subject of the essentiality of controls is far from the simple matter which it may seem on the surface was obvious from the replies of several of the respondents who initially expressed reservations or objections (subsequently withdrawn) to some of the ideas embodied in this program.

Over-all, however, the replies were keynoted by the response of one member of the Council on Dental Therapeutics of the American Dental Association who noted that in reviewing numerous articles pertaining to the therapeutic effectiveness of different medicinal agents, only infrequently were the studies adequately controlled or was the "double blindfold technic," used.

The following additional comments of our consultants and committee men seem most apropos and revealing:

1. There is no statistical manipulation which can compensate for an inadequate or non-comparable control.

2. A deficiency in control cannot be remedied by the inclusion of larger numbers of subjects.

3. Uncontrolled observations are often valuable, but with suitable controls they are usually of much more scientific value.

4. Various control procedures are usually known to investigators. Some apparently do not wish to employ them because of the additional time and effort required and perhaps in an occasional instance because their employment may affect their "results."

5. It is difficult to conceive that research, worthy of the name, could even be classified as research if some form of control were not used . . .

6. Everyone will agree that he believes . . . all original scientific research which can be suitably controlled should be controlled. The world being what it is, I imagine the difficulty will be for them to live up to their beliefs and to persuade others to respect them.

7. There will be wide differences of opinion as to just what is a control and greater differences of opinion on just what is a suitable or an adequate control.

8. A prime purpose then should be to stimulate referees in various fields to formulate statements as to appropriate controls—which provisional codifications might be of value to research as are the Marquis of Queensbury rules to boxing.

9. Undue claims must not be condoned in the absence of controls.

With reference to the remarks quoted in number 7, Albritton[6] has listed six unities of measurement, all of prime importance to the consideration of controls: time, place, material, procedure, personnel, and mental attitude.

EXCEPTIONS AND EXEMPTIONS

The following exceptions and exemptions were noted in the replies:

1. Case reports are of interest and contribute to our knowledge—controls are usually impossible. Statements of theories or hypotheses not intended to be substantiated in the paper by experimental evidence are not research. Such articles may be very provocative and serve a real purpose. These and review articles should be judged on their individual merit.

2. In all areas of research, unusual circumstances may perhaps be present in which rigid requirements for controls should be waived.

3. The exceptions should be for relatively extraordinary reasons.

4. Some experiments on animals may be expected to include large numbers of controls while it is obvious that similar relative numbers could not be required for many of the experiments involving humans.

5. There are differences in the nature of suitable controls applicable to studies of various types in various fields.

Thus a liberal and flexible interpretation should prevail. The importance of controls lies in the character and interpretation of conclusions drawn from the

2. Russell, A. L. Clinical testing of dental caries preventives: a summary. J.A.D.A. 54:275 Feb. 1957.

3. American Dental Association, Council on Dental Therapeutics, Council on Dental Research, and Council on Dental Health. Clinical testing of dental caries preventives. Chicago, American Dental Association, 1955.

4. American Dental Association, Council on Dental Research. Recommended stipulations for academic-industrial research contracts. J.A.D.A. 54:121 Jan. 1957.

5. Pearlman, S. Essential requirements for effective research in dental therapeutics. J.A.D.A. 48:49 Jan. 1954.

6. Albritton, E. C. Six unities in medical research. J.A.M.A. 161:328 May 26, 1956.

data. Statements of theories or hypotheses not intended to be substantiated in a paper by experimental evidence perhaps do not merit publication at all.

ACCEPTANCE OR REJECTION OF UNCONTROLLED RESEARCH

To the question, "Should the absence of the suitable use of controls be sufficient cause by itself for rejection?," the replies were nearly unanimous that rejection usually should be the case, indicating a predisposition to follow the basic principle to its terminus, without, however, a desire for inflexibility. Implicit in these statements is the idea that such exceptions should remain exceptions rather than the rule. Great latitude should be allowed as to the "suitability" of controls, whereas the absence of controls should meet with more stern consideration. Where suitable, untreated controls or placebo-treated controls were suggested as essential requirements.

RESPONSIBILITIES OF EDITOR, REFEREE, AND RESEARCHER

The right of the editor to apply suitable "standards" to papers is an inalienable one. However, a concerted effort should be directed at the appointment of more editors who are qualified by experience to pass upon such criteria of acceptability as "controls."

One consultant was fearful lest editors "untrained in the field of research attempt to apply rigid standards for the acceptance of research papers." Nevertheless, the editor has authority which must be exercised. This survey was made in an attempt to propose a principle under which this authority can be exercised learnedly and fairly by those appointed to the responsible job of editor.

It could also be concluded that the editor, the institution from which a paper emanates, the institution's research committee, the journal's publication committee, the editor's referees and consultants and researchers themselves all share the responsibility for evaluating papers and rejecting unsuitable material. "In the final analysis, the journal's publication committee or editor should probably assume the authority in consultation with advisers."

The editor enters the picture rather late.

> If he can perceive that controls were needed but were not used; if he will reject reports that exemplify these deficiencies and if he has the fortitude to state the grounds for his rejection, he will force additional researchers to more conclusive methods.

THE RESOLUTION

Most respondents concluded that they probably would be willing to endorse for publication a resolution to the effect that "as a matter of principle and under not unusual circumstances, all manuscripts or research projects which were suitable for the application of controls and which have not been so treated should be rejected for publication."

However, in recognition of some pitfalls which were suggested as possibly resulting from editors accepting such a resolution overenthusiastically, and acknowledging the near-impossibility of defining a universally suitable control or all suitable exceptions, the revised resolution seemed warranted and desirable and has been approved by our consultant panel, the Scientific Manuscripts Committee, the Board of Directors of and the membership of the American Association of Dental Editors as follows:

> In research investigations, the design of the study should include adequate experimental controls. Acceptance for publication of a report of an investigation performed without controls when controls were possible should, if justified, be considered an exception to this principle rather than a sound general practice. The ultimate responsibility (in terms of publication) for allowing such an exception should rest with the editor.

630 West 168 Street

Fully privileged members of the Association and number of delegates as of December 31, 1957

Herewith is a tabulation of the number of fully privileged members of the Association, by district, constituent society and federal dental service, as of December 31, 1957. The list also indicates the number of delegates allocated to each constituent society and federal dental service for the 1958 annual session.

Each constituent society and each federal dental service, until 1960 inclusive, shall be entitled to one delegate without regard to the number of members. The remaining number of delegates, to the limit established by the By-laws of the American Dental Association, shall be allocated to constituent societies proportionally to their number of active and life members. Each constituent society may select from among its fully privileged members the same number of alternates as delegates.

The allocation of delegates remains the same as for the 1957 annual session with the exception that Delaware of the Fourth District gains a delegate and Wisconsin of the Ninth District loses one.

Table • Fully privileged members of American Dental Association, December 31, 1957

	Active, dues paid	Active, no dues*	Life members	Total	1958 delegates
First District					(32)
Connecticut	1,450	7	79	1,536	8
Maine	306	4	21	331	3
Massachusetts	2,552	—	250	2,802	14
New Hampshire	236	—	7	243	2
Rhode Island	382	—	35	417	3
Vermont	123	—	9	132	2
Second District					(55)
New York	10,996	19	389	11,404	55
Third District					(26)
Pennsylvania	4,973	54	233	5,260	26
Fourth District					(35)
Air Force	545	—	—	545	1
Army	596	—	11	607	1
Delaware	118	—	6	124	2
Dist. of Columbia	517	—	51	568	4
Maryland	911	—	28	939	5
New Jersey	3,024	—	135	3,159	16
Navy	863	—	5	868	1
Public Health Serv.	213	—	2	215	1
Puerto Rico	206	—	—	206	2
Veterans Admin.	594	—	4	598	1
Panama Canal Zone	18	—	—	18	1
Fifth District					(34)
Alabama	671	—	35	706	4
Florida	1,201	—	38	1,239	7
Georgia	781	9	54	844	5
Mississippi	405	8	28	441	3
North Carolina	974	—	38	1,012	6
South Carolina	319	—	30	349	3
Virginia	959	—	42	1,001	6
Sixth District					(25)
Kentucky	815	22	91	928	5
Missouri	1,718	34	102	1,854	10
Tennessee	1,076	—	17	1,093	6
West Virginia	491	—	49	540	4

	Active, dues paid	Active, no dues*	Life members	Total	1958 delegates
Seventh District					(28)
Indiana	1,590	4	130	1,724	9
Ohio	3,689	—	211	3,900	19
Eighth District					(26)
Illinois	4,855	—	435	5,290	26
Ninth District					(28)
Michigan	3,168	81	176	3,425	17
Wisconsin	2,020	47	129	2,196	11
Tenth District					(18)
Iowa	1,153	—	195	1,348	7
Minnesota	1,889	—	210	2,099	11
Eleventh District					(29)
Alaska	39	—	—	39	1
Idaho	227	—	3	230	2
Montana	247	—	30	277	2
Nebraska	695	—	47	742	4
North Dakota	204	1	31	236	2
Oregon	960	2	59	1,021	6
South Dakota	214	—	14	228	2
Washington	1,413	18	78	1,509	8
Wyoming	126	—	6	132	2
Twelfth District					(37)
Arkansas	402	8	26	436	3
Colorado	719	—	79	798	5
Kansas	709	3	50	762	5
Louisiana	784	7	34	825	5
New Mexico	197	—	12	209	2
Oklahoma	669	9	47	725	4
Texas	2,469	33	124	2,626	13
Thirteenth District					(43)
Arizona	288	—	3	291	2
California	3,084	60	79	3,223	16
So. California	3,772	—	142	3,914	19
Hawaii	313	—	—	313	2
Nevada	91	—	—	91	1
Utah	389	—	23	412	3
Total	74,408	430	4,162	79,000	416

*Includes 1957 student members who were accepted as active members.

COUNCIL ON DENTAL THERAPEUTICS

Council announces classification of additional products

The classification of products by the Council on Dental Therapeutics has been described in a previous report (J.A.D.A. 40:489 April 1950). The Council's program now provides for classification of products in Group A, Group B, Group C and Group D. Products are reconsidered periodically, and decisions are subject to change at any time that a substantial amount of new evidence becomes available. The files of the Council contain information on many drugs and dental cosmetics, and inquiries are welcome.

GROUP A

Listing of products in Group A means that at the time of their consideration, the items conformed with the provisions for acceptance established by the Council on Dental Therapeutics and adopted by the Board of Trustees and the House of Delegates of the American Dental Association. Items in this group will be listed in *Accepted Dental Remedies,* and may use the Seal of Acceptance, unless otherwise provided.

GROUP B

Listing of products in Group B means that there is insufficient evidence to justify their present acceptance, but there is reasonable evidence of their usefulness and safety. These products meet the other qualifications and standards established by the Council on Dental Therapeutics. It is the Council's opinion that Group B products may be promoted for special use and study.

The Council's initial consideration of products which may be eligible for Group B listing is influenced favorably by the knowledge of further investigations then in progress. It is the policy of the Council to reconsider Group B products each year on the basis of new evidence which may be produced in their support. Classification in this category is not ordinarily continued for more than three years.

The following additional products are classified in Group B:

Dietary Fluorides (See J.A.D.A. 56:589 April 1958)

Fluoritab Tablets (The Fluoritab Corporation): A tablet intended for use in prescribing supplements of dietary fluoride, stated to contain 1 mg. of fluorine in the form of sodium fluoride in each 78 mg. tablet. The tablet is scored for dividing into two halves.

Methylbenzethonium Chloride (See A.D.R. 1958, p. 89)

Concentrated Bactine (Miles Laboratories, Inc.): Each 100 ml. is stated to contain methylbenzethonium chloride, 4 per cent; alcohol, 32 per cent; polyethylene glycol mono-iso-octyl phenyl ether, 2.8 per cent; chlorothymol, 0.8 per cent, and inert ingredients, 60 per cent. This is a concentrated solution. The dilution of Bactine with 7 parts of water for chemical disinfection of instruments provides a solution containing 0.5 per

cent of methylbenzethonium chloride. (See report at bottom of page).

GROUP C

Listing of products in Group C means that the evidence is so limited or inconclusive that the products cannot be accurately evaluated. It is the Council's opinion that Group C products require further study by qualified investigators.

GROUP D

Listing of products in Group D means that they are unacceptable because of their demonstrated inability to meet the standards outlined in the provisions for acceptance.

Council reclassifies erythromycin in Group A

On the basis of available evidence at the time, two brands of erythromycin were classified in Group B.[1] It was the Council's opinion that this antibiotic was a useful prophylactic agent against the effects of bacteremias in those patients who required such protection but were sensitive to penicillin. It was also believed that this antibiotic was useful in the control of some infections caused by penicillin-resistant organisms. In its original report, the Council emphasized that sufficient evidence was lacking to warrant consideration of erythromycin on an equal basis with penicillin and the tetracyclines as adjuncts to dental practice.[2]

In view of information based on the clinical experience which has accumulated since the earlier report, the Council now concludes that the usefulness of systemic dosage forms of erythromycin and its salts in the practice of dentistry has been adequately demonstrated. The Council therefore has reclassified certain brands of this antibiotic in Group A (see J.A.D.A. 56:292 Feb. 1958).

1. American Dental Association. Council on Dental Therapeutics. Council announces classification of additional products. J.A.D.A. 52:353 March 1956.

2. American Dental Association. Council on Dental Therapeutics. Erythromycin and carbomycin—agents for use where penicillin is contraindicated. J.A.D.A. 52:350 March 1956.

Council classifies Concentrated Bactine in Group B

Concentrated Bactine, a germicidal solution containing methylbenzethonium chloride as an active ingredient, is promoted directly to the dental profession. This is a concentrated preparation intended for dilution with water before use.

The Council has recognized the dental usefulness of this product for (1) sanitization of the skin of the hands, (2) cleansing, sanitizing, and deodorizing inanimate objects about the office, and (3) disinfection of dental instruments.

The precautions and limitations associated with chemical disinfectants apply also to Bactine (see A.D.R. 1958, p. 88). The label for this product contains a warning against the use of the product in the mouth.

The Council on Dental Therapeutics has classified Concentrated Bactine in Group B for the usual period of one year.

COUNCIL ON JOURNALISM

Preparation of manuscripts for meetings and publications of the American Dental Association

The Council on Journalism, at its 1958 annual meeting, March 22, reviewed and approved a revised version of an article entitled "Preparation of Manuscripts for Meetings and Publications of the American Dental Association." The article was first published in THE JOURNAL in May 1949, and this modified version is submitted by the Council in an effort to assist authors in the preparation of manuscripts for publication.

The high standards of present dental scientific meetings have been developed only by the careful selection of essayists and clinicians. Each year the selection becomes more critical and the competition between essayists more keen. Program chairmen and essayists alike recognize the impropriety of wasting the valuable time of an audience with a poorly prepared paper. Fortunately, most scientists who have become sufficiently proficient to warrant an invitation to participate in a scientific program can prepare an acceptable paper.

However, some excellent technicians and operators are unaccustomed to presenting their material in written form. Aware of this, they seldom or never appear as essayists, with the result that their contributions are lost to the profession. Such dentists should obtain the assistance of a competent writer to aid in the preparation of their material.

GENERAL SUGGESTIONS

All papers delivered at meetings of the Association are subsequently referred to the Editor's Office, where they are considered for publication in THE JOURNAL. Much time and effort can be saved if the manuscripts are prepared in conformity with the style of THE JOURNAL. A paper that is not accepted for publication will be returned to the author, and the Association will waive any further claim to it.

Previous Publication • An article that has been published previously under the same or a different title, or one that contains extensive excerpts from a previously published paper, is not acceptable for presentation at a session of the Association or for publication in THE JOURNAL.

Papers presented at a session of the Association should not be promised by the author to another organization for publication unless released by the Editor's Office of the Association.

Physical Preparation of Manuscript • At least four copies of the manuscript should be made. Two carbon copies should be sent 60 days prior to the meeting to the Council on Scientific Session at the Central Office of the Association. One of these copies is for the information of the Section chairman; the other is supplied the Bureau of Public Information for possible publicity purposes. The original copy, together with all the illustrations, should be given to the section officer at the meeting immediately after completion of the essayist's presentation. This original copy, which is transmitted by the Council on Scientific Session to the editorial depart-

ment of the Association, must be typed, double or triple spaced, on bond paper and must include all revisions and illustrations. One copy of the manuscript should be retained by the essayist.

The original manuscript should be typed, double or triple spaced, on one side of 8½ by 11 inch bond paper. Carbon copies may be made on onionskin. Margins at least one inch wide should be allowed on each side of the paper.

Title • The title of the article should appear at the top of the first page of the manuscript, followed by the name of the author or authors. If a number of men have collaborated in the preparation of a paper, preferably two, certainly not more than four, should be listed as main authors. Others should be listed as consultants. Listing of several authors for a single paper greatly increases the volume and complexity of work involved in indexing the article.

Gratitude • Expressions of gratitude to persons who have assisted in the preparation of an article are without scientific value, and it is the policy of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION to delete them.

Signature and Address • Authors should use a uniform style in signing articles in order to avoid confusion in indexing. For example, an author should not sign one article John J. Jones, another J. J. Jones, and still another John James Jones or J. James Jones, Jr.

The academic and professional degrees of the author and the name of the city in which he practices or resides should follow his name. Earned degrees only are published in THE JOURNAL. Honorary degrees are deleted.

The street address of the principal author should be given at the end of the paper.

Introductory Footnotes • The name of the section of the Association or the society before which the paper was delivered and the date and place of delivery should be given in a footnote. The author's university, hospital or government position also should appear in a footnote.

Use of Trade Names • The use of trade names of products and appliances should be avoided wherever possible. The importance of using correct terminology instead of proprietary names or nondescriptive terms cannot be overstressed. The scientific names of pharmaceuticals accepted by the Council on Dental Therapeutics are listed in the *Accepted Dental Remedies,* published by the Association.

Proper Names and Abbreviations • Spelling of proper names should be verified by reference to standard works.

Abbreviations should be used sparingly. Nonstandard abbreviations should be used only when necessary to conserve space in tables, and then they should be carefully explained.[1] If an operation or procedure bearing a man's name is used, it should be one well-known to the profession or defined in the standard medical dictionaries; otherwise it should be explained fully by the author.

Subheadings • Short subheads or division headings are desirable in long or medium length papers. Manuscripts of less than 1,200 words may not require them. Subheadings aid the author to present his material logically, enable the reader to select quickly the subtopics in which he is most interested and improve the appearance of the article by breaking up pages of solid type.

Quotations • If material is quoted from another author, permission must be secured from both the author and the publisher as required by copyright laws. The

1. Fishbein, Morris. Medical writing, ed. 3. Philadelphia, The Blakiston Co., 1957.

responsibility for securing this permission rests primarily on the writer. Quoted material should be quoted exactly except that obvious typographic errors should be corrected.

CONSTRUCTION OF A SCIENTIFIC MANUSCRIPT

Purpose of Article • Manuscripts submitted for publication in THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION should (1) present new facts, describe new technics or methods of practice, or set forth or re-evaluate principles of real value, (2) contain the results of well-controlled, original research or (3) provide a complete review of the facts concerning a particular subject so that the reader may deduce therefrom legitimate, important conclusions.

Outline • The writing of a scientific manuscript can be expedited by first preparing a comprehensive outline. A good outline also aids in preventing the author from committing common errors of repetition, verbosity and circumlocution. A simple outline consists of headings for each of the main divisions of the subject and subheadings for the secondary topics to be discussed under each main head.

Types of Articles • There are many kinds of articles of which the two probably most frequently presented are (1) the account of a new technic or procedure, and (2) the report of a research investigation. Each type requires a somewhat different form and outline.

Research Articles • A standard formula for research investigations and one preferred by THE JOURNAL consists of eight parts: (1) the title, (2) an introduction, (3) an account of the materials and methods employed in the investigation, (4) the presentation of the original data, (5) discussion of the data, (6) a summary, (7) the conclusion, and (8) bibliographical footnotes.

1. Title • The importance of a good concise title cannot be overstressed, as titles serve three principal purposes. They designate the subject, attract the reader and are one of the principal means by which articles are indexed. Many good articles are lost to the literature because they are not indexed or are improperly indexed owing to poor or inaccurate titles.

Interrogations should not be used as titles. Attention-getting titles are acceptable if they express the content of the paper and are not inane or flippant.

2. Introduction • The introduction should consist of only such matters as will enable the reader to begin the article with understanding. It should include a statement of the subject or problem to be discussed and, if advisable, a limited amount of historical data. A review of pertinent literature is valuable and often necessary, but unless the references are selected carefully the review will be worthless. Ordinarily, numerous and extensive quotations from previous writers should be avoided as they give the paper a hodgepodge appearance and detract from reader interest. Short quotations are justifiable and mention of the work of others is often essential in a scientific paper, but bibliographic references should take the place of extensive discussions of previously published material.

3. Materials and Methods • The way in which the investigation was carried out usually should be related briefly and exactly. This account should include the materials, the animal or human subjects employed, the instruments and procedures of the investigation. Standard methods and equipment do not require description, and footnote references are sufficient for published accounts of methods or equipment.

4. Original Data • The original data should include appropriate charts, tables, graphs and other illustrations. Data pre-

sented in charts and tables should not be duplicated in the text.

5. Discussion of Data • Discussion of data consists of a presentation of the author's views, findings and conclusions based on the original data presented. The author may wish to compare his findings with those presented by others.

6. Summary • The summary should consist of a concise statement of the purpose of the article and should recapitulate observations or statements of fact. Articles of less than 1,500 words usually need no summary.

7. Conclusions • The conclusions consist of deductions based on the data presented or reviewed. They usually consist of numbered sentence statements.

The busy dentist appreciates a good summary and conclusion as these help him determine whether it is worthwhile to read the entire article.

8. Bibliographical Footnotes • Bibliographic references should be listed at the end of the paper. They should be numbered to correspond with the numbers placed in the text where they apply.

Account of New Technic • An article presenting a technical procedure or operation should be organized as a sequence of steps or stages. If the contribution of the author consists only of a modification of standard procedures, the whole sequence of steps should not be presented in full, but only insofar as necessary to relate the new feature or features with the whole procedure.

References • Footnote references to articles published in periodicals should include the family name and initials of the authors, the title of the article, the name of the periodical, and the volume, page, month and year. Example: Jones, E. X., and Keyson, O. L. Oxidation of cellulose by nitrogen dioxide. J.A.D.A. 31:1458 Oct. 1944.

References to books should include the name of the author, title of the book, edition, location and name of the publisher, and year of publication. Example: Boyd, William. A textbook of pathology, ed. 2. Philadelphia, Lea & Febiger, 1943. A list of standard abbreviations of dental publications can be secured from the Bureau of Library and Indexing Service of the American Dental Association or by consulting past issues of THE JOURNAL.

Illustrations and Tables • Illustrations should be limited to such subjects as are mentioned in the text and referred to there as numbered figures. Good, clear illustrations, preferably unmounted glossy print photographs, should accompany the manuscript. Illustrations should be numbered consecutively in the order in which they are to appear and should be referred to by number at the proper place in the text. Each illustration should bear the author's name.

If explanatory marks such as letters or arrows are absolutely necessary, they should be drawn on the photograph by an accomplished artist. If the author does not have access to an artist he should indicate clearly, on transparent paper laid over the illustration, the position of the markings so that they may be made by THE JOURNAL'S artist.

Paper clips or hard pencil marks on the backs of photographs may mar them and cause shadows in the finished illustration.

Short descriptive legends for illustrations and graphs should be typed on a separate sheet of paper and numbered to correspond to the numbers on the illustrations. The legend should be descriptive only and should not be used to augment the text.

Drawings and graphs should be made on heavy, white cardboard or graph paper with India ink by an accomplished artist. Graph paper should have a background

of black lines if the background is to be retained. Blue, which does not reproduce in the engraving process, should be used if it is not desired that the lines appear.

Tables should be typed on separate sheets, given a heading and numbered to correspond to the reference number that is inserted in the appropriate place in the text.

Alterations • Editorial alterations will be made in order that the article may conform to the style of THE JOURNAL. The unabridged *Webster's New International Dictionary*[2] is the guide used by THE JOURNAL for academic terms and *Dorland's Illustrated Medical Dictionary*,[3] supplemented by *Blakiston's New Gould Medical Dictionary*,[4] for medical and anatomic terms.

2. Webster's new international dictionary, ed. 2. Springfield, Mass., G. & C. Merriam Co.

3. Dorland's illustrated medical dictionary, ed. 23. Philadelphia, W. B. Saunders Co., 1957.

4. Blakiston's new Gould medical dictionary, ed. 2. Hoerr, N. L., and Osol, Arthur, editors. New York, Blakiston Division, McGraw-Hill Book Co., Inc., 1956.

COUNCIL ON LEGISLATION

Association testimony on federal grants-in-aid proposals for remodeling and expanding dental school facilities

On April 22 and 23, representatives of the Association and the American Association of Dental Schools participated in a panel hearing before the Subcommittee on Health and Science of the House Committee on Interstate and Foreign Commerce to urge approval of a five-year, 50 million dollar program of federal grants-in-aid for constructing teaching and research facilities in dental schools.

The Association witnesses were Francis Herz of San Francisco, member of the Council on Legislation, Harry Lyons, dean of the Dental School of the Medical College of Virginia, and Shailer Peterson, secretary of the Council on Dental Education. Clemens V. Rault, dean of the Dental School, Georgetown University, represented the American Association of Dental Schools. Dean Rault is chairman of the Committee on Legislation of the American Association of Dental Schools. Bernard J. Conway, secretary of the Council on Legislation, was present at the hearing.

The statements presented by Doctors Herz and Peterson follow:

I am Francis Herz of San Francisco. I am engaged in the general practice of dentistry. I am a member of the Council on Legislation of the American Dental Association. With me is Dr. Shailer Peterson of Chicago, who is secretary of the Association's Council on Dental Education. We are here today to present the Association's position on the three proposals before this committee to provide grants-in-aid to dental schools and related institutions for constructing teaching and research facilities. The American Dental Association has a membership of 90,000 and represents more than 80 per cent of the nation's dentists.

POLICY OF AMERICAN DENTAL ASSOCIATION

Representatives of the American Dental Association have testified before Congress in support of federal grant-in-aid legislation for assisting the dental schools four times since 1949. In that year the Association's House of Dele-

gates adopted the following resolution at its annual meeting:

"*Resolved,* that the American Dental Association approve the policy that Federal funds, with justification, might be appropriated in support of dental education programs, provided that such funds when appropriated should be accepted with the understanding that the Government shall not exercise any control over, or prescribe any requirements with respect to, the curriculum, teaching personnel, or administration of any school or the admission of applicants thereto."

Each of the bills which are the subject of these hearings is in keeping with the policy of the American Dental Association.

RECOMMENDATION

The American Dental Association urges Congress to enact legislation which will provide federal grant-in-aid funds to assist in the construction, expansion, remodeling and equipping of vitally needed teaching and research facilities for the nation's dental schools. Specifically, the Association recommends that the grants authorized be adequate to assist the existing 47 dental schools to fulfill their essential needs over the next five years. The total cost of this five-year program would be $95,000,000 or thereabouts.

The Association also recommends that provision be made for the construction of at least eight new dental schools during the next five to ten years. The Association estimates that the total cost of this construction would be $30,000,000. Dr. Peterson will amplify these recommendations in his statement.

The detailed information on the specific financial needs of the dental schools, which Dr. Peterson will present, will illustrate that Representative Roberts' bill, H.R. 11913, is best adapted to meeting the essential requirements for expanding dental teaching and research facilities.

At this time, I should like to call on Dr. Shailer Peterson, secretary of the Council on Dental Education. Dr. Peterson is a specialist in the field of education, having obtained his doctorate in that field.

DR. PETERSON'S TESTIMONY

I am Dr. Shailer Peterson of Chicago. I am secretary of the Council on Dental Education of the American Dental Association and am here to present the Association's position on the legislation that has been proposed to stimulate the construction of critically needed educational and research facilities in dentistry.

This committee has available to it the very excellent *Staff Report* assembled in 1957 by the professional staff of the committee on the basis of data submitted by the American Dental Association and other agencies concerned with the educational and research needs of the dental institutions in this country. It is not my intention to review the information which has been provided in the report prepared by your staff other than to submit more current information where available and to supplement some of the data which were not available in complete form at the time the *Staff Report* was prepared.

PRESENT CAPACITY OF DENTAL SCHOOLS

There are now 47 dental schools in operation with an enrollment of 15,645 students. Of this total 1,052 students are enrolled in graduate, postgraduate and special courses and 1,314 are enrolled in dental hygiene courses. (An additional 842 dental hygiene students are being trained in ten schools which are not affiliated with dental schools, but which offer programs that have been approved by the American Dental Association.) Four new dental schools have been opened since October 1956, and have increased undergraduate dental student enrollment by 126.

From October 1955 to October 1957, undergraduate dental school enrollment has increased from 12,730 to 13,279; the number of students engaged in special studies or seeking an advanced degree has increased from 539 to 597; the number of dental hygiene undergraduates has increased from 1,160 to 1,340; the number of continuing or refresher students has increased from 4,673 to 5,017. The continuing expansion of training programs offered by the schools in these years reflects the constant effort of the schools to meet the growing demand for dentists and dental auxiliaries made necessary by the prevailing population growth and the replacement of dentists and auxiliaries lost through death and retirement from active practice.

With the single exception of last year, the number of dental graduates has increased each year for the past decade, and this increase can be expected to continue for the next several years. It is estimated that nearly 3,100 dentists will be graduated in June 1958, and that by 1961, when all of the existing schools will be graduating students, the number of graduates will reach about 3,400. However, when the death and retirement rates for dentists are taken into consideration, and in view of the rapidly increasing population growth in

this country, the efforts that have been made by the dental profession and dental educators are not adequate to maintain the proportion between dentists and population as it exists today. Data supporting this statement and observations on other factors which substantiate the clear need for an expanded program for producing dental manpower are available in many of the publications of the American Dental Association.

RESEARCH ACTIVITIES IN DENTAL SCHOOLS

As is true in all scientific and professional fields, the educational institutions are responsible for the conduct of a large part of the research in the field. In dentistry, it is estimated that more than 80 per cent of the research is conducted in dental schools and closely related academic facilities. Among the many reasons for this condition is the very essential relationship which exists between higher education discipline and research in that field. One of the important criteria used by the Council on Dental Education in its evaluation of dental education programs is the existence of an active program of research, as indicated by the following statement from the *Requirements for the Approval of a Dental School*: "The mere prosecution of routine class and laboratory assignments is purposeless without genuine scientific approach; no dental school fulfills its mission unless the spirit of research permeates the activities of both teachers and students . . ."

Although the dental schools have been cognizant of this important responsibility for a number of years, they have been handicapped in developing a truly effective program by the lack of adequate financial support. As recently as ten years ago, federal support of dental research was practically nonexistent. Up to that time, despite the fact that dental disease is the nation's most prevalent disease—afflicting 95 per cent of the population—there was no coordinated plan under which personnel and facilities could be marshalled for an investigation into the causes of dental disease. Through the support given by Congress to the activities of the National Institute of Dental Research, a significant program of dental research is now a reality and investigators from all parts of this country are now making an intensive search into the nature of oral diseases and their relation to the general health of our people. This expansion occurred chiefly as a result of the appropriations provided by the Congress in 1956 and 1957 for grants to the dental schools and other dental research centers.

It must be recognized, however, that this program is yet in the beginning stages. In terms of the research capacity of this nation, the potential in the area of oral disease investigation has only been touched. Much more needs to be done; for example, with available personnel and facilities, the dental schools are in a position to carry on at least a hundred projects in addition to those being conducted and those to be activated this year. The growth of research in the dental schools, moreover, is essential to a continuing improvement in the standards of dental education.

As will be pointed out in later sections of this report, the dental schools have been able to expand considerably their facilities for educating dental students during the past several years and have plans to expand still further in the future. The need for increasing the space for training additional dental and dental hygiene students has been so great, however, that the schools have not been able to participate as many would have liked in the Health Research Facilities Act. The Council reported to this committee in June 1955 the amount of construction funds that might be utilized by the dental schools for the construction of research facilities and was concerned when the participation of the dental schools in this program did not approach the extent that had been indicated. However, further investigation into this matter confirmed the fact that the dental schools were confronted with the very difficult decision of how the funds which they had available for matching construction grants might best be used. Even though many of the schools need expanded research facilities desperately, and even though most of the schools could have qualified for grants under the terms of the Health Research Facilities Act, they felt constrained to withhold applications for the purely research construction grants in anticipation of a federal matching grant program which would be usable for the construction of both teaching and research facilities.

I am confident that the dental schools will participate to a substantial extent in the matching grant program for the construction of research facilities if legislation is approved which would make possible the construction of both teaching and research quarters. The bill introduced by Representative Roberts, H.R. 11913, particularly, is a realistic approach to a solution of the problem which has confronted those institutions that feel an obligation to expand both teaching and research facilities and do not have the funds to engage in purely research construction at the possible expense of the essential construction of more educational facilities.

ALTERNATIVES CONFRONTING DENTAL SCHOOLS

It appears now that the population projection of 228½ million by 1975 is realistic. American Dental Association statistics show that in 1955 there were 87,599 dentists in active practice for a population of 162,248,000. This would indicate a dentist-population ratio of 1:1,886. On the basis of the present number of dental school graduates, it can be estimated that by 1975 there will be about 104,461 dentists in active practice. This is an adjusted figure which allows for a normal rate of death and retirement of dentists now in practice. In this projection there would be a dentist-population ratio of 1:2,187 by 1975. To maintain the 1955 ratio of 1:1,886, the schools would have to graduate 16,669 more dentists than their present capacity will permit, or about 833 more students per year, over the 20 year period.

Many leaders in the profession and many dental educators view these statistics with real concern. To provide sufficient manpower in the future to maintain 1955 levels of dental care, which is a conservative basis for there is every reason to believe that the per cent of the population seeking dental care will continue to increase, there would appear to be four alternate methods that should be given serious consideration:

1. Expand existing facilities through remodeling and additions to present school plants.
2. Construct additional new facilities.
3. Increase the use of dental auxiliary personnel.
4. Expand the dental research program.

The schools will work toward a solution of the problem by using one or more of these four approaches, each doing so within the limits of its financial ability to expand and its present need for additional space and new equipment.

EXPANSION OF FACILITIES THROUGH REMODELING

The Council on Dental Education recently conducted a survey of the dental schools to determine the extent to which their enrollments could be increased if federal matching funds were available. According to the information submitted by the schools, if matching funds were made available, the existing schools would be in a position to expand their undergraduate enrollments by 636 dental students a year within the next five years. An additional 594 dental hygiene students could be accepted into these expanded facilities, according to the survey results. Twenty-five schools (53 per cent) would start new programs to train auxiliary personnel; 10 schools (22 per cent) would start new programs to train an additional 225 dental hygiene students per year; 17 schools (36 per cent) would plan to have training programs for dental assistants; 7 schools (15 per cent) would expect to introduce new programs for the dental laboratory technician. Thirty-four schools (72 per cent) intend to enlarge their facilities for conducting research; 35 schools (74 per cent) would remodel or build new facilities to increase the number of graduate degree programs; and 34 schools (72 per cent) would provide additional study programs for the postgraduate student. It is obvious from these figures that even without the addition of new schools to the present 47 now in operation, enrollment capacity for undergraduate, graduate, and auxiliary personnel would be increased in impressive numbers. In this five year period, coincidentally with the increase in the size of its physical plant, the quality and scope of dental education would also be improved. By additions to the physical plant, the purchase of new equipment for science laboratories and clinics, the teaching and research programs at many schools would gain in both effectiveness and efficiency.

In addition to this expansion of existing facilities, there are definite plans to establish two new dental schools within the next two years and reasonable assurance that an additional seven or eight schools will be put into operation within the next ten years. The two schools for which nearly definite provisions have been made are in Kentucky and Florida. There has been serious discussion of the possibility of establishing dental schools in the following states: South Carolina, Oklahoma, New York, Connecticut, California, Colorado, and possibly in Utah. There is no doubt that the existence of a federal matching grant program for construction of teaching facilities would hasten the establishment of these schools and, in at least some of the cases, it is unlikely that the schools could be established without a federal matching grant program. On the basis of a two thirds matching grant for new construction, it is estimated that the two states which have definite plans at the present time would request grants of about five million dollars. If the ten year provision for new construction were to be approved on a two thirds: one third basis, the seven or eight schools which now appear to be in the stage of serious study and planning would be in need of 25 to 30 million dollars, depending on the size of the institution planned and other

factors. This would mean, then, that new dental school construction which can be anticipated within the next ten years could be aided materially, and in some cases assured, by the provision of 30 to 35 million dollars within the ten year periods proposed in H.R. 11913.

INCREASE IN USE OF AUXILIARY PERSONNEL

The dental profession, like other health professions, is aided materially by the services of auxiliary personnel who are trained to perform certain functions which do not require the direct participation of the dentist. During the past few years there has been increasing recognition of the extent to which the effective utilization of these auxiliary personnel makes it possible for the dentist to devote his time to those procedures for which only he is qualified. For example, current studies show that a dentist can increase his weekly patient load by 36.8 per cent by employing one auxiliary and 68.8 when he employs a second. Provided that he had from two to three well equipped operating rooms, a dentist working alone and seeing up to ten patients a day can, with the aid of auxiliaries, serve from 16 to 18 patients a day. As recently as 1956, surveys have been made by the American Dental Association which show that about 23 per cent of the independent dentists in the United States had no employees. Even though the percentage of dentists employing auxiliary personnel has increased from 73.1 per cent in 1952 to 77.1 per cent in 1955, statistics would suggest that a still greater use of auxiliaries by all dentists will help solve the problem of providing an adequate dental service during the coming years.

In the next five years, as well as in the years beyond 1962, the dental schools will not only have to increase enrollment capacity for dental students but also for the auxiliary forces as well, if the profession is to meet its full responsibility in providing a maximum level of dental health care without any impairment in the quality of its dental service. Dental hygienists are now graduated at the rate of 945 per year and approximately 4,500 are now in active practice. Dental laboratory technicians trained in both school and on-the-job training programs currently number about 28,000. Of this total, 25,000 are employed by some 7,000 private laboratories. About 65,000 dental assistants now serve the dental profession.

At the 1957 annual meeting of the Association in Miami, Fla., the American Dental Association approved revised training and certification standards for laboratory technicians. This recent action by the Association serves to implement further the present policy of the dental profession to solve its manpower shortage through the expansion of training programs for auxiliary personnel. In October 1957, the question of training and certification of dental assistants was widely discussed and investigated in a workshop sponsored by the Association's Council on Dental Education. Even though the profession does not yet have its own approved program for the training of dental assistants, it appears probable that such a program will be presented to the House of Delegates within the next year or two. After the establishment of educational standards for the dental assistant by the dental profession, there is little doubt that the dental schools and other appropriate institutions will inaugurate training programs for this important dental auxiliary.

In a recent directive from the House of Delegates of the American Dental Association, all dental schools have been urged to encourage the use of dental auxiliaries in the undergraduate dental curriculum. All undergraduate dental students are being taught the effective use of the hygienist, the technician and the assistant under conditions simulating private dental practice. As schools can increase their physical plants for the training of auxiliary personnel, continued advances in teaching the important role of the auxiliary in private practice will be made. Through the dental schools, the profession is making substantial forward progress in training students in the use of auxiliaries and simultaneously, it is training a growing number of these auxiliaries for service to its present needs. As has already been indicated in the previous section, the dental schools would definitely plan to expand their educational efforts for auxiliary personnel if funds were to be made available for the provision of additional space and equipment needed for these programs.

EXPANSION OF DENTAL RESEARCH PROGRAM

A final approach to providing dental care in the future which will compare favorably with the dental service available to the population in 1955 lies in the field of dental research. Although all of the dental schools are now engaged in dental research activity, there is much room for expansion of this important activity. The Association has already requested that Congress give consideration to increasing the budget recommended for support of National Institute of Dental Research grants by

one million dollars in fiscal 1959, on the basis of conclusive evidence that the potential now exists for at least this degree of expansion in research in the dental schools. This modest request is based on the present facilities and on the trained personnel now available for research purposes. When it is realized that more than 40 per cent of the schools budgeted less than $30,000 for the support of dental research during the past year, it is clear that the amount of research in many of the schools is very limited. To a substantial extent, this limitation is related to the lack of sufficient space and adequate equipment in these schools to carry on research projects properly. An indication of the extent to which the dental schools are interested in expanding their research facilities is indicated by the fact that 34 schools (72 per cent) would plan to expand their research programs if construction funds were made available.

FUNDS NEEDED FOR EXPANSION OF FACILITIES

In an effort to determine as precisely as possible the construction needs of the dental schools for the next five years and to secure a realistic estimate of the extent to which the schools would be in a position to participate in a federal matching grant program, the Council on Dental Education conducted a survey of all of the dental schools in January 1958. In summary, the survey showed that the existing schools would plan to expand their teaching and research facilities by about 93 million dollars during the next five years and could presently anticipate over 40 million dollars for matching purposes. In addition, 83 per cent of the schools indicated that they were certain that the availability of a federal matching grant program would aid materially in the raising of funds for construction of teaching and research facilities; thus, there is little doubt that at least one half of the money needed (45 to 50 million dollars) for the matching of the 93 million dollar construction program would be available.

Full accomplishment of these objectives could be expected to result in the enrollment of an additional 636 dental students a year (an increase of 18 per cent), 594 more dental hygiene students a year (51 per cent increase), and enable the schools to expand or initiate programs for the training of graduate and postgraduate students, dental assistants, and dental laboratory technicians. More specifically, from 1958 to 1962, 40 schools would plan to expand existing programs in the areas of research, graduate and postgraduate studies, and 25 schools would start new programs in the areas of research, graduate and postgraduate and auxiliary training.

As already indicated in this statement, it is estimated that new dental schools now being planned or which can be anticipated within the next ten years will need 15 to 20 million dollars for the construction of their facilities.

No mention has yet been made in this report of a very important consideration related to this proposed legislation, but one which is extremely difficult to evaluate in terms of exact quantitative terms. Although the dental schools in this country have spent more than 60 million dollars during the past ten years for the modernization and expansion of their buildings and equipment, there are still many schools which are in desperate need of funds to make improvements in their facilities if they are to maintain the high level of dental education which has been characteristic of the dental schools in this country.

The increased operating costs of dental schools, the expanding demand for graduate and research programs, and many other pressures common to all educational endeavors at the present time have made it increasingly difficult for the schools to keep pace with those improvements in plants and equipment which are so important if the quality of dental education is to be maintained. There can be no doubt that the adoption of a federal matching grant program for construction of dental teaching facilities will contribute not only to the quantity of dental care available to the people of our country but also to the quality of service which can be provided during the years ahead.

In summary, the American Dental Association urges this committee to approve legislation to assist the schools of dentistry and dental hygiene to meet the cost of constructing vitally needed teaching and research facilities and to help offset the cost of new dental school construction. The plan encompassed within Representative Roberts' bill (H.R. 11913) is particularly noteworthy, not only for its recognition of the realistic financial needs of existing health research and teaching institutions, but for its assurance that adequate funds for new school construction will be available over an extended period of time.

COUNCIL ON DENTAL HEALTH

New administrative device in public assistance programs: the dental service corporation

John M. Frankel, D.D.S., M.S., San Francisco

Dental programs in public assistance are not new. They have existed as long as there have been medical services offered. As a matter of fact, they represent one of the first attempts to provide dental services for a large group of people. They are admirable in both intent and accomplishment, and they have fulfilled a very great need among recipients of public assistance.

It would be well to take a brief look at the dental problem. Dental diseases are almost universally experienced. Dental caries is man's most common disease. It begins almost with the appearance of the first teeth in the mouth and continues throughout life. During childhood and adolescence, this disease progresses at the rate of one tooth per year, slowing up somewhat when the individual attains adulthood. The next most common dental disorder, periodontal disease—or disease of the supporting tissues of the teeth—is the principal cause of tooth loss in the adult population.

The foregoing facts apply to the population as a whole in the United States. The caries attack rate, of course, varies in different areas of the United States and, perhaps, of the world. A wartime study of 7,000 aviation cadets[1] showed Oregon ranking tenth among the states with 18 carious teeth per man, and Washington first with an astounding 21 carious teeth per applicant.

There is no reason to believe that the situation has improved in the postwar period. Although no specific information is available on the amount of dental disease occurring in public welfare recipients, it is safe to assume that their dental needs are at least as great as those of this select group of aviation cadets.

In recent months, two simultaneous movements have been developing which can change the entire picture in dental care for public assistance and help welfare agencies provide even better services for a greater portion of their public assistance clients. One of these movements is occurring within the dental profession itself and the other within administrative agencies responsible for public assistance.

Organized dentistry is becoming aware that it must develop mechanisms through which large consumer groups can be provided with quality dental service. Accordingly, state dental associations are evolving administrative devices known as dental service corporations, nonprofit corporations set up under the laws of the various states by organized dentistry itself to provide quality dental service to groups financing payment through third party insurance plans and prepayment. These dental service corporations are the devices through which organized dentistry is attempting to provide legal, ethical,

Presented before the 1957 West Coast Regional Conference of the American Public Welfare Association, October 8, 1957.

Assistant regional dental consultant, U. S. Public Health Service, Region IX.

1. Senn, W. W. Incidence of dental caries among aviation cadets. Mil. Surgeon 93:461 Dec. 1943.

good quality dentistry through the licensed dentists of the particular jurisdiction, simultaneously permitting the purchasing group to deal with a single administrative entity in the payment of care for its beneficiaries. The implications in terms of auditing, quality control and policing of the vendors are quite evident, the purchaser buying services from a single agency which represents all of the vendors.

The second movement underway is the increasing interest on the part of public welfare administrators to provide broader dental services for recipients. The impetus has been provided by monies made available under the 1956 Social Security Amendments. Hence, some enormous problems in a hitherto neglected area can now be met.

In the Pacific coast region, these two movements met and married in the state of Washington. One of the country's best and most active dental service corporations has been operating there. The Washington State Dental Association formed the Washington State Dental Service Corporation originally to provide care for dependents of longshoremen of the International Longshoremen's and Warehousemen's Union through a fund administered jointly by the union and the Pacific Maritime Association, an organization of the employers on the waterfront.

This service corporation was the natural entity for enlarging the scope of the dental program for the state of Washington's Department of Public Assistance. The department now has a contract with the Washington State Dental Service Corporation which began even before the new matching monies were available through the 1956 Amendments to the Social Security Act. It is making history by providing a magnificent service to welfare recipients of the state, using modern concepts for the provision and payment of dental care.

Thus, the country has arrived at a point in history when the dental profession is prepared to provide services for large purchaser groups. At the same time, the states now have more money to spend for public assistance recipients through the mechanism of increased funds made available under the 1956 Amendments. All concerned agree to the enormity of the need for dental services. Administrators can and, it is indicated, will develop some sort of well-thought-out, well-planned, well-conceived program to meet those dental needs in each of the several states in the region. An enormous program began in California in October 1957.

With regard to scope of program, there are several questions to be considered:

1. The categories of recipients of assistance, including various age groups.
2. The categories of dental services to be rendered.

To a certain extent, scope will be determined by basic enabling legislation. Although dental activity may not be spelled out categorically, it is by implication an integral part of medical services as defined in most legislation. Thus the over-all policy for general medical services will determine to large extent what the dental policy will be. As many persons are aware, the wording of basic legislation often serves merely as a guide line, leaving specific content to be determined administratively. Administrative willingness and vision are as essential to broad dental programming as are the funds that back the legislation.

TYPES OF PROGRAMS

In the following paragraphs, consideration will be given to what the program content would be in three general types of programs: a minimum program, an intermediate program and an adequate program. Under each type, consideration will be given to programs involving children and those involving adults. It would be desirable, if it were possible, to put price tags on each and every item at this

time. Unfortunately, actuarial information of sufficient validity to give out such figures is not yet available. The only information to date is that which is available in the ILWU-PMA program and those figures which are beginning to come out of the state of Washington program in public welfare. Perhaps a year from now, more definitive information will be available.

A Minimum Program • For either adults or children, a minimum program would be limited to those items which are considered emergent services. Such a program would include only the following:

1. Alleviation of pain—usually by extraction of the offending tooth or teeth.
2. Treatment of acute infection, such as acute ulcerative stomatitis (Vincent's disease).
3. Treatment of oral neoplasm (cancer).
4. Elimination of oral infection retarding the treatment of acute systemic disease.

This kind of program is one commonly found in public welfare programs, and it goes a long way toward meeting the immediate pressing need of the population served. It was not intended nor does it pretend to be a well-rounded complete program.

An Intermediate Program • Care under an intermediate program would include those services available under a minimum program plus the following:

For children:

1. All necessary extractions.
2. All necessary operative restorations (fillings).
3. All necessary treatment for soft tissue disease.

For adults:

1. All items included for children.
2. Construction of complete dentures where the patient is edentulous or where the patient has an insufficient number of masticating teeth for adequate nutrition.

In some instances involving adults there is difficulty, because, in the process of rehabilitating the recipient and making him a productive citizen, it is necessary to have teeth replaced for esthetic reasons or for reasons of improving speech. Under an intermediate program, it would seem that some discretionary power would have to rest with the administrators of the dental program and the caseworker who would consult together to decide on particularly needy persons for this type of treatment. Partial dentures and fixed bridgework do not fit easily into a program of this nature for adults. The cost of the construction of partial dentures and bridgework would tend to deplete the limited funds.

An Adequate Program • An adequate program might be called "ideal," but that might infer the unattainable, and, in many instances, this type of program is attainable. There is evidence in the state of Washington as well as in California.

Any program, but especially an adequate program, should make provision for completion of the dental service authorized insofar as it is possible and practical. Such provision has been established in the public assistance policy under the 1956 Amendments which provide that services can be continued for six months after discontinuance of money payments.

For children, an adequate program would have to include the following, in addition to what has been described already:

1. It would have to include space maintenance after prematurely extracted deciduous teeth. This inclusion puts the program into the realm of prevention, and is why the program is listed as fully adequate. A program of space maintenance is preventive orthodontics.
2. An adequate program has to include prevention of dental caries. In

communities where water fluoridation is available, this type of service is automatically a part of the tax structure; no additional funds need be expended. However, in communities where water fluoridation does not exist, it is necessary to use fluorides topically applied by the dentist or dental hygienist to the teeth of children.

Philosophically, how does prevention fit into this kind of program? If a dollar in tax money is expended today to save 10, 20, 30 or 40 dollars in some year to come, many taxpayers would applaud the expenditure. The judicious use of topical application of sodium fluoride for the prevention of dental caries is an instance of such a saving. This line of reasoning can be used to explain the program to legislators and administrators.

It is obvious that the type of program chosen for any state will depend on the availability of funds. There is no reason why priorities cannot be set up for the provision of dental care for one category or age group of the recipients of public welfare, using one type of program, and another segment utilizing a completely different type of program. In some states, it may be practical, for instance, to use an adequate type of programming for children and a minimum program for adults, as California is considering.

Whatever the scope, an important factor for the success of any large-scale care program is operation under an adequate fee schedule. In the past, it was possible for limited programs to obtain first class dentistry for second class fees. Dentists were willing—even anxious—to do their part as long as the demands on them were financially reasonable. Now, however, the programs envisioned will absorb a large part of the dental manpower in any community and much of the time of a great number of individual dentists. Public assistance is competing in an already tight market for services in demand by others. Labor and professional groups, fraternal organizations and, soon, private insurance programs will be directly competing with public assistance programs. It would be well for public assistance to get the dentist in the habit of furnishing his services to public programs now, but this pattern can be achieved only through meeting the competition. Its establishment means a fair and adequate fee schedule. By and large, dental associations stand ready to discuss this matter realistically, if the purchaser is not thinking of cut rate dentistry but, rather, quality dentistry at a reasonable cost.

There are many additional questions confronting the profession. There should be some protection of the taxpayer in the matter of quality. It has been said frequently that quality cannot be judged in this kind of program and, to carry it one step forward, that it would be difficult to evaluate any dental service. It is difficult to agree with this point of view. State boards of dental examiners, and for that matter, every one of the 40 odd dental schools in the country, systematically evaluate the work of dentists and dental students. For this kind of program, the only evaluation of the service needed would be: is the service adequate or is it not?—not whether it is poor, fair, good or excellent. The profession could and should perform the evaluation for the purchaser of the service. The profession certainly would not tolerate any other agency's evaluating the professional services of its own members. Therefore, it is beholden on the profession itself to perform the function within its own ranks.

A second question would be that of providing services on a statewide basis. Nearly all dental societies have met this situation before in other federally supported programs. In any state where there are large geographic areas without dental services, a very difficult, but not insurmountable, problem can exist. It is possible to move patients to the source of care if care cannot be carried directly to the patient.

A third problem is that of orthodontics. It could be included under an adequate program, but it might not belong there. Certain patients will have a malocclusion so severe that there is an urgent need for treatment, either because of function, esthetics or speech. Such instances might well fall within the province of the community's crippled children's program. Most of the states either have an active program to provide orthodontic services in extreme cases or could have under their operating definitions. Orthodontics is an area in which administrators of public assistance should get together with their counterparts in crippled children's programs to define their respective areas of interest and responsibility. At best, the problem is not a simple one and certainly bears further discussion and consideration.

COMMENT

The foregoing problems need not deter progress. In the face of tremendous needs, there are greater financial resources to meet them. Perhaps more important are the attitudes which reflect a desire to meet the challenge of providing dental services for welfare recipients. State health departments are a resource available to dental societies in thinking through and planning programs. Organized dentistry stands ready to do its part. The opportunity is here for bold and dynamic approaches to the solution of the problem.

The Council has pointed to the dental service corporation as the most effective mechanism presently available for the administration of organized plans for the group purchase of dental care.* On the basis of the Council's recommendation, the House of Delegates adopted the following statement of policy in November 1957:†

Constituent societies which may anticipate the development of sufficient demand for organized plans for the group purchase of dental care should give consideration to the establishment of a dental service corporation but only after consultation with competent legal counsel.

The dental service corporations on the West Coast have been administering successfully the International Longshoremen's and Warehousemen's Union-Pacific Maritime Association dental program for children of union members. The establishment of the contract between the Washington State Dental Service Corporation and the Washington Department of Public Assistance for the W.S.D.S.C. to administer the state's dental program for recipients of public assistance is another demonstration of the effectiveness of the dental service corporation as an administrative mechanism for increasing the availability of dental care. Accordingly, the Council arranged for this publication of Dr. Frankel's paper, "New Administrative Device in Public Assistance Programs: The Dental Service Corporation," as a Council report in THE JOURNAL in order to make his observations available to all state dental societies. Dr. Frankel's paper was presented at the meeting of the Western Branch of the American Public Welfare Association, October 8, 1957.

*Transactions of the American Dental Association, 1957, p. 95.
†Transactions of the American Dental Association, 1957, p. 390.

COUNCIL ON DENTAL EDUCATION

Fourteenth Congress on Dental Education and Licensure

Part I of the Council's report (*J.A.D.A.* June 1958), presenting the papers and discussions heard at the Fourteenth Congress on Dental Education and Licensure contained papers describing the experimental programs being conducted at the University of Texas, Ohio State University and the University of Tennessee. Part II of this report contains the papers and discussions of the unique programs which are offered at the University of California, Harvard University and Western Reserve University.

The members of the examining panel whose views of each of the second three papers have been summarized below are: Allan G. Brodie, chairman of orthodontics department, College of Dentistry, University of Illinois; Robert W. McNulty, dean, School of Dentistry, University of Southern California; Rene O. Rochon, dean, School of Dentistry, University of Detroit. Harold W. Oppice, chairman of the Council on Dental Education, served as discussion moderator.

Part II is the concluding section of the Council's report of the Fourteenth Congress on Dental Education and Licensure.

THE UNDERGRADUATE ORTHODONTIC PROGRAM AT THE UNIVERSITY OF CALIFORNIA

Wendell L. Wylie, D.D.S., M.S., San Francisco

The special curriculum known as the undergraduate orthodontic major has for its objective the training of specialists in orthodontics, and has been in effect at the University of California for 25 years. An appropriate yardstick for its evaluation is the typical graduate or postgraduate course conducted in so many other universities for the attainment of the same end. By inviting the comparison, we do not imply that our course is so much better, nor do we argue that the graduate courses should be abandoned in favor of what we are doing. But after having had the opportunity to judge the products over so many years, we have concluded that our graduates are as well prepared for the practice of orthodontics on the day of graduation as they would be if they had taken a conventional dental course and then prolonged their formal education by another two years. Thus they enjoy a two-year advantage over would-be orthodontists enrolled in other schools.

In order to make this possible we had to perform a bit of surgery on the last three years of the conventional undergraduate dental curriculum. The freshman year remains pretty much like the first year in other schools. Toward the end of that year about 20 men will have applied for Curriculum II, the orthodontic major. Eight of these men will be chosen on the basis of their previous dental and predental records. For these eight students, instruction in prosthetics and

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crown and bridge will be curtailed. In the freshman year, before the class was split, they had taken a thorough course in prosthetics which acquainted them with the fully adjustable articulator and taught them setups of artificial teeth for the edentulous patient. In the sophomore year, these men had been given a special course in crown and bridge in which they had learned the fundamental preparations on model teeth. To put it as concisely as possible, those enrolled in the undergraduate orthodontic major get some of the rudiments of both subjects, but no clinical experience in either prosthetics or crown and bridge. In all other respects, students in Curriculum I (restorative dentistry) and Curriculum II (orthodontics) take identical programs and meet the same requirements. Some stress should be put on this fact, since the inaccurate criticism has been voiced that ours is a course which is "all orthodontics"; it is not all orthodontics and never has been. When our graduates take the State Board, they do so with no labels attached and expect no concessions.

By eliminating this much of prosthetics and crown and bridge from the usual dental curriculum, we gain time to offer, over a three-year period, essentially what is presented in a graduate or postgraduate course of 18 months. Thus the total program could be regarded as a final two years of clinical experience, preceded by a year (the sophomore year) of preparation for the clinic.

SOPHOMORE YEAR—CURRICULUM II

Didactic work in the sophomore year, then, deals with the development of orthodontic concepts, the validity of certain diagnostic procedures, and the step-by-step formulation of an orderly treatment plan. It also takes up the development of some of the orthodontic appliances, emphasizing the contributions of Edward H. Angle. Although other appliances are not entirely neglected, his "edgewise arch" receives by far the most attention.

Students are taught to take impressions, to pour and process models, and to correlate these records with face photographs and roentgenograms, both intraoral and cephalometric. In both semesters of the sophomore year there is given an orthodontic technic course, providing instruction and experience in freehand soldering, band formation and arch-wire fabrication. By adhering to a strict schedule, it is possible to cover enough ground so that the student can be sent into the clinic for one period a week in the second semester of the sophomore year. This is actually part of the technic course, and each student is assigned one specially chosen patient at that time, who becomes the nucleus of the student's practice. We are firmly committed to the plan of introducing the student to the patient as early as possible, and also committed to the corollary idea of presenting didactic and background material throughout the professional course.

JUNIOR YEAR—CURRICULUM II

In keeping with this principle, we long ago moved the course labeled "growth and development" out of the sophomore into the junior year, at the same time getting case analysis and treatment planning earlier in the course where it belongs. "Growth and development," now a junior course, covers more territory than the name implies, and depends heavily on the preclinical sciences of the two previous years. Students read intensively in the original literature of orthodontics and related fields, and a critical approach is consistently encouraged. With a class never numbering more than eight students, the seminar method is a logical and fruitful one.

It is appropriate here to deal with the question frequently asked, "Do these undergraduates have the maturity for

this kind of study?" This question is asked by dental teachers whose experience has been not only with undergraduate classes numbering 50 or more, but also with small postgraduate classes. Undoubtedly the latter situation offers something which is lacking in the former, but I am convinced—through contact with both kinds of groups—that it is not so much a matter of maturity as it is the flexibility of the small group. Undergraduate dental students have very real potentialities, and we are fortunate in being able partially to explore them.

At the beginning of the junior year the student with the orthodontic major enters the clinic for an experience which will extend over 21 months. Most of them will elect to follow their patients through the summer between the junior and senior year, although this is not required. The junior student carries about ten patients, some of them new and others transferred from graduating seniors. There are four clinic periods a week, each period lasting three hours.

SENIOR YEAR—CURRICULUM II

The clinic schedule in the senior year is identical, and in fact juniors and seniors are scheduled in the clinic together. During the senior year the patient load is about 26. We have never had a formal quantitative requirement. Our problem has never been how to deal with the shirker, but rather how to find tactful answers for the students who want to take on more work than they can reasonably handle.

As in the two previous years, there are didactic courses for seniors. The seminar approach continues to be useful; much of the material is drawn from the practices of the part-time staff, and occasionally the class will actually meet in the man's office. These off-campus sessions became possible with what we call the "clinical conference," originally devised for another purpose. When we had our postgraduate course we found we liked the long seminars not possible with the traditional "50-minute hour" of academic life. Furthermore, we wanted students to have seminars with staff members other than those responsible for didactic instruction. Accordingly, we now set up a full year in advance a series of clinical conferences. The clinic is closed for one of the two classes (junior or senior) and this group of eight has a session with an instructor whom they ordinarily meet only at the chair. Thanks to an indulgent dean, we have enough staff so that no hardship is worked on the class remaining in the clinic.

The didactic instruction of the senior year is designed to supplement the clinical instruction on actual patients, which even in two academic years cannot cover the whole gamut of orthodontic experience. Students are confronted with out-of-the-ordinary situations, with conditions which demand the flouting of pat formulae and easy generalizations. This is also the time to present practice management as it pertains particularly to orthodontics, the design of the orthodontic office, use of auxiliary personnel, appropriate record-keeping, and the legal responsibilities entailed in the practice of orthodontics.

So much for description. Let us examine what advantages, if any, this unique program enjoys over the conventional graduate or postgraduate course.

First there is the advantage of getting into the specialty two years earlier. This is so obvious that it need not be developed at any length, particularly in a time when two years of military service is almost a certainty for the young dental graduate.

A second substantial advantage is the spreading out of instruction over three years. It is an educational axiom that work distributed over a long interval of time is more effectively learned than is the same amount of work given in concentrated doses. A California orthodontic

student has time to contemplate and to correlate his learning as he goes along, to confront instructors with ideas he has mulled over for two years. For a six-year period after World War II, we had not only the undergraduate major, but a postgraduate program as well. Because the same staff was involved, and because both types of students were frequently together, these two concurrent types of orthodontic training could be looked upon as a controlled experiment in orthodontic education. This experience, plus some snooping in other institutions, has led me to the generalization that the graduate or postgraduate student is, by comparison, a little bit naive. His period of preparatory training for the clinic was relatively short, for prolonging it would cut into the time available for clinical experience. By the end of his clinical training, he may have seen no patient through from start to finish. In short, time is all on the side of the undergraduate major, and at comparable points in the two academic courses he is the more seasoned of the two, in spite of the fact that chronologically he is two years younger.

If you are going to pass judgment on our plan of education, first you must answer this question: "If a man wants to be an orthodontist, must he first have completed in the mouth four complete upper and lower dentures, a complete upper and a lower partial denture, and two partial dentures, plus three bridges, two porcelain crowns, two porcelain inlays and three other crowns?" Because our orthodontic majors do some of these things in the laboratory and complete all other phases of the conventional dental course, it is legitimate to ask whether or not their fitness for orthodontic practice depends on the completion of this limited amount of dental service for adult patients.

I want to dwell on this question, and in doing so, to examine partially the nature of professional education. A professional curriculum consists of the understanding of principles on one hand, and the mastery of technics on the other. Because dentistry is one of the health sciences, the dental curriculum and the medical curriculum have certain evident similarities. If these courses of common interest are taught properly in the dental school, the stress is laid on the principles which both the dentist and the physician must understand, with no great emphasis on the technics necessary for the practice of medicine. No disparagement of technics is intended; dentistry is and always will be a highly technical profession, and the technics which are actually to be used had better be taught in a thoroughgoing manner.

In deleting certain courses in prosthetics and in crown and bridge in order to offer an undergraduate orthodontic major, we are justified on two counts: first, the orthodontist will never use the technics taught in either field, and secondly, undergraduate teaching in each of these fields consists almost entirely of technics. Principles of denture prosthesis are there to be learned, I am sure, for those who have learned sufficiently well the technics. But the principles seem to be reserved for postgraduate courses and meetings of special societies, and the typical undergraduate lecture is likely to start out, "First you take a diamond disk . . . .," and conclude on the same pragmatic note. If the instructor were given still more time in the curriculum, he would be more likely to add a bridge to the requirements than to broaden the undergraduate student's view of this type of dental service. The undergraduate teacher of prosthetics or crown and bridge is hard-pressed as it is, trying to teach all the things he would like his students to know. I sympathize with him, but see no reason why our orthodontic students must suffer along with him.

It was said at the outset that we do not regard our orthodontic major as being vastly superior to the conventional

graduate or postgraduate course. We contend simply that it, too, does a good job of educating a student for the specialty of orthodontics. We would even concede that there are a few points where the other program has an edge.

Graduate and postgraduate programs usually include a number of hours in the kindred basic sciences. Such courses undoubtedly are valuable, particularly when they are conducted at a genuinely advanced level and are not merely repetition of the same material from undergraduate years. Our students take the preclinical sciences in the freshman year and concurrently with the orthodontic courses; the level of instruction is undergraduate, and there can be no special effort at slanting the instruction for the benefit of orthodontic students. Such emphasis must come in courses offered by the department itself.

Another valuable feature provided in some graduate courses is experience in independent research. Not every man who took his Master's degree made a substantial contribution to his field, perhaps, nor came out of it imbued with the spirit of investigation. Nonetheless, it is a good thing and we make required reading of some of these research reports, thereby paying honest tribute to what has been done in other schools. From time to time we do have students who undertake the additional task of carrying out a project under the supervision of a staff member, with results which compare favorably with the efforts of bona fide graduate students. In recent years the undergraduate fellowships sponsored by the United States Public Health Service have lent encouragement to such independent effort.

Having conceded two advantages enjoyed by the conventional courses, I should perhaps deal with certain other criticisms which have been voiced. I hope that I have dealt effectively with the canard that we have abandoned instruction in everything but orthodontics, by pointing out that only two subjects of the dental curriculum have been modified and that we have even retained portions of them.

Let me take up a criticism of a slightly different kind. It is likely to come from a person who has perhaps seen our plan in operation, or is acquainted with the abilities of its graduates. He will concede that it is an acceptable device for the training of orthodontic specialists. He nonetheless disapproves, because to do otherwise might allow a precedent for some other kind of specialty training. In rejoinder, I can only say that if we are to be paid the compliment of imitation, it should be by some other department of orthodontics—not by some other specialty. Orthodontics has lent itself very well to this modification of curriculum; it is a service rendered primarily to children, and the technical procedures which we consider safe to omit are intended for adults and have no application in orthodontic practice. Moreover, orthodontics is a distinct specialty which is normally entered with a sharp break from general practice, as opposed to a gradual increase in emphasis on the special field. The official organization demands exclusive practice as a condition of membership and to strike a more mundane level, the general practitioners in the community make the same demands on the orthodontist. Once a man has prepared himself for the specialty through formal training, there are virtually no temptations for him to try his hand at other phases of dental practice. On one score or another, the plan does not lend itself well to any other specialty, and for that reason we suggest that our special curriculum be appraised only for what it is, a means for educating orthodontists.

All that has been said thus far could have been said were the program merely contemplated, whereas it has been in effect for 25 years. The most telling argument in behalf of Curriculum II is the quality of its graduates. Just how

one is to document this observation is open to question. But in an attempt at documentation, I have turned to figures available from the American Board of Orthodontics, the oldest specialty board in dentistry. In this context we are primarily interested in clinical competence. Fortunately, orthodontic records (models, photographs, roentgenograms) afford means of assessing clinical ability with some facility. Thus I believe that results on the American Board of Orthodontics make possible certain comparisons. In recent years this Board has gone beyond merely certifying acceptable candidates, so that where men have shown unusual distinction in the examination, it has been suitably recognized. The case reports which the man submits as a part of his examination may be so good that he will be invited to give them the following year at the annual meeting of the parent association. The thesis which is required of every candidate may be chosen for publication, or for reading at the next annual meeting, or for recommendation to the various constituent societies of the American Association of Orthodontists. For the purposes of this paper, I have lumped all these things together and called them "special distinction."

Here, then, are the figures:

Since 1932, 123 orthodontists have graduated under our plan. In the same period, as nearly as I can make out from the Orthodontic Directory, 1,250 men have completed graduate or postgraduate courses.

Fifteen men, or 12 per cent of our graduates, have applied to the American Board of Orthodontics for certification. One hundred and five, or 8 per cent of the other group, applied during the same period. Apparently, our graduates compare favorably with respect to their interest in certification.

No Curriculum II graduate has ever failed the American Board of Orthodontics; the over-all record for failures on this Board is 12 per cent, but that includes all categories, and figures are not available with respect to types of training.

Of those who achieved certification, special distinction was earned by 73 per cent of California graduates—11 out of 15; 41 out of the 105 graduates of other courses, or 39 per cent, received similar commendation.

In summary, the California orthodontic major is a modification of the conventional undergraduate dental curriculum which eliminates certain technical procedures in denture prosthesis in order to offer, within the undergraduate years, the equivalent of a postgraduate course in orthodontics. Its graduates may thus begin a specialty practice two years earlier, and while enrolled in the course they enjoy the advantage of instruction spread over 34 months instead of approximately 18. Upon graduation they are qualified to limit their practices to orthodontics, and over the years they have compiled a favorable record with official bodies of the specialty. And as miraculous as it may seem, the omission from their background of 12 dentures and 15 units of bridgework is discernible only in a very strong light.

DESCRIPTION OF COURSES—CURRICULUM II

An outline of the orthodontic courses of Curriculum II follows:

Sophomore Courses •

Orthodontics 425A-B: Technics and introduction to clinical practice; 7 units; Dr. Paden.

Lectures, demonstrations and laboratory experience intended to teach principles and develop skill in: filing and soldering, formation and placement of orthodontic bands, staples, tubes, and so on. Formation of orthodontic arch wires and their attachments (edgewise and lingual arches emphasized). Construction of devices to provide extraoral anchorage. Construction of retaining appliances in general use. Complete records on a selected orthodontic case and the construction of a complete edgewise arch appliance for this patient; this patient later becomes part of the student's "practice."

Orthodontics 420A-B: Fundamentals of orthodontics; 4 units; Dr. West.

Lectures, seminars and reading assignments intended to provide background in orthodontic diagnosis and treatment planning (Angle, Simon and others) as introduction to modern practices. Orthodontic diagnosis and treatment planning, utilizing: examination of the patient, intraoral and cephalometric films, models and photographs. The place of measurements in orthodontic diagnosis. Rationale of orthodontic treatment in terms of: indications for certain appliances; bracket principle; intraoral types of anchorage and extraoral anchorage. Specific problems encountered in treatment, that is, extraction. Selection of auxiliaries, such as loops, coil springs, and so on. Limitations of orthodontic treatment. Planning retention and problems which arise during retention.

Junior Course •
Orthodontics 430A-B: Growth and development; 4 units; Dr. Wylie.

Lectures, seminars and library research intended to: provide grasp of general principles of human growth, prenatal and postnatal, and the assessment of physical fitness. Provides specific knowledge of human craniofacial growth, including sites of growth in relation to age, interaction of growth sites as reflected in facial pattern, aberrations of craniofacial growth. To provide an understanding of jaw kinetics; rest position, mandibular displacement, path of closure, temporomandibular joint disturbances, electromyography. To explore the known facts regarding the interaction of heredity and environment as related to malocclusion: genetics of teeth and jaws, reaction of bone to local pressures, the dentition as an easily molded entity. To study tissue responses—favorable and unfavorable—to orthodontic pressures.

Junior and Senior Courses •
Orthodontics 438-448: Clinical practice in orthodontics; 4 units; Dr. West and staff. A total of 720 clock hours (16 units) spread over 21 months. This is a typical course in clinical practice ordinarily encountered in graduate courses, with principal emphasis on edgewise technic. We make it plain to the students that we select this one appliance not because of its superiority over all the others, but because we believe that if an orthodontist is to master several appliances, he should take them one at a time.

Clinical conferences: At regular intervals an entire clinic period is stricken from the schedule for the junior and senior classes and the instructor ordinarily on the floor that period holds a seminar for the entire class in clinical subject matter. This provides the long unbroken session which is so advantageous in orthodontic teaching, and provides an opportunity for the instructor not ordinarily scheduled in the classroom to discuss with the students orthodontic matters which he could not discuss at length beside the chair.

Senior Courses •
Orthodontics 440A-B: Advanced clinical orthodontics; 2 units; Dr. Murray.

In this course Dr. Murray "specializes" in the problems which cannot be presented firsthand as teaching examples, and by drawing on a long experience in orthodontic practice presents many problems which the students otherwise would not see. The emphasis is on the office side of practice, and the course is an effective bridge between the academic days and the days of office practice. Attention is given to practice management, ethics, public relations and fees.

A course is given by Dr. Snyder under the heading of "Orthodontics 441" during the final semester, and in considering the course description for Dr. Murray's course, although it may be similar, one could hardly say that it was duplication.

DISCUSSION SUMMARY

Comments and discussion of Dr. Wylie's paper served to point up some of the advantages of the California undergraduate orthodontic program. First, Curriculum II, now in its twenty-fifth year, has proved its value for training the student for a specialty; namely, orthodontics. As a program limited to this objective, it is not experimental in any way. Further, the California program is valuable to the students who, as undergraduates, are able to make the decision to become specialists in orthodontics. By having an undergraduate program with an emphasis on a single phase of dentistry, a more thorough training result is accomplished and proficiency in a specialty can be acquired more directly than would be possible in the traditional dental program.

The discussion, however, emphasized some negative aspects of this program too. First, by placing a greater emphasis on clinical instruction relating to the specialty, the effort to correlate instruction in the basic sciences with the clinical practice of dentistry is diverted. Observers noted that the California program represents a departure, in this respect, to one of the basic functions of the traditional program (that is, using the basic science studies as a foundation for the teaching

of clinical dentistry). A second, and frequently repeated question concerned the problem of producing teachers and research workers. From the panel and audience both, a doubt was expressed that this more specialized curriculum would produce many graduates for teaching or research. A third question centered on the issue of the student's maturity, as a freshman dental student, to select a specialty practice. Closely related to this question was a corollary idea concerning students who failed or who later decided on some other phase of dental practice, at the senior year or on graduation. These students would have but little transferable training and skill for other occupations and thus would result in economic waste and cause psychological problems for both the student and school. Further, graduates of the California program were not thoroughly enough trained to practice general dentistry. At least another year of dental school would have to be undertaken. A final question underlined the precedent which is established at California in having an undergraduate course tailored to meet the training qualifications of a single specialty. If this idea is good for orthodontics, it is good, too, for oral surgery, prosthodontics, and so on. If a trend of this type develops, the standard curriculum is endangered, perhaps even lost.

Dr. Wylie was asked by the moderator to reply to the questions which were raised by the members of the examining panel and the audience participants. Consideration of program timing in the morning session prevented a reply to each of the questions. However, in answering the question of training for teaching and research, Dr. Wylie observed that graduates of his school were contributing substantially to dental literature and that many were now teaching at California, and at least two were teaching at other dental schools. In defining research to mean making an original contribution to knowledge in a particular field of interest, he stated that, in his opinion, the California graduate did make a contribution to dental research and teaching. In regard to the student's maturity to select a specialty as freshman and sophomore dental students, he commented that all dental students are considered mature enough to choose the profession of dentistry; if they have sufficient maturity for this decision, he feels that they have sufficient maturity to select a specialty. Further than this, Dr. Wylie observed that, after completing the four year dental program, the student has some idea of all phases of dental practice, but not necessarily a better idea of what is entailed in any one specialty practice. The question of failures and change of interest at graduation did not appear too serious to the speaker. He recalled that two graduates had elected to practice in pedodontics (a field in which the California program qualifies them to practice) and two others elected to open a general practice. Although admitting that California orthodontic graduates were not completely trained for a general practice, he would ask if graduates of the standard curriculum are well enough trained to practice orthodontics, even to a limited degree.

Dr. Wylie concluded his comments by observing that the general practice of dentistry need not be undertaken in order to select a field of specialization. The example of medicine would contradict this position. He observed that individual differences in people, rather than experience alone, governs the decision to specialize. The students who are admitted to the California program are both self-screened and screened by the school to undertake a study of orthodontics and consequently are well suited to follow the special emphasis and direction of the training program which is offered.

THE CLINICAL DENTAL EDUCATION AT HARVARD UNIVERSITY

Roy O. Greep, Ph.D., Boston

The Harvard plan of dental education evolved from a reorganization of the Harvard Dental School in the years just preceding World War II. The program has undergone a number of curricular modifications but there has been no significant shift in objectives.

The Harvard School of Dental Medicine now offers a four year course of study leading to the D.M.D. degree. The freshman and sophomore years are devoted to preparatory work in the basic biological sciences. During this time the Harvard medical and dental students meet as a combined class and observe the same standards of scholarship. The third

Dean, Harvard School of Dental Medicine.

and fourth years are almost wholly given over to preclinical and clinical instruction. Although most of this is presented in the School's dental clinic, significant additional experience in oral medicine, oral surgery, pedodontics, anesthesiology, periodontics and neoplasms is also variously provided at the dental clinics of the Massachusetts General Hospital, the Children's Hospital, the Boston City Hospital and the Forsyth Dental Infirmary for Children. All of these dental clinics except that at the Boston City Hospital are in the charge of full-time appointees of the School.

A unique feature of our program is that our dental students receive full courses in all the basic medical sciences; namely, anatomy, physiology, biological chemistry, bacteriology, general pathology, pharmacology, and physical and laboratory diagnosis. I shall not comment on the content of these courses except to indicate that where it is appropriate and feasible, the dental students are given special instruction slanted to problems of the oral structures. This is in addition to instruction on the oral cavity given to all medical and dental students. The dental students also receive during this period six to ten orientation lectures in general oral problems by members of the dental staff. Moreover, the freshman and sophomore students maintain contact with the dental school by reason of the fact that representatives from the dental staff take part in the teaching of many nondental aspects of the basic science courses, by being assigned to an adviser on the dental staff, by attendance at special lectures and social gatherings of the School, and by holding membership in dental student organizations.

In making this teaching arrangement work at Harvard no factor has been more critical than the quality of the student. The nature of the program places a special premium on scholastic ability for the initial two years and on ability to meet clinical standards for the final two years. Finding students who are outstanding in both of these respects has not been an easy matter. It seems relevant to remark briefly on our policies in regard to admissions.

With rare exceptions our students have had four years of college work and about 10 per cent hold master's degrees. We require the A.D.A. aptitude test and recommend the Medical College Admission Test. The student's college record, recommendations and personal interview all contribute weightily to his acceptability for admittance. Our experience to date suggests that away from the mean, the A.D.A. test indicates quite reliably the capacity of our students to perform in basic sciences as well as in clinical studies. Earlier we felt obliged to select students with primary attention to the academic score. In recent years we have been placing increasing emphasis on the manual score. The present freshman class of 16 men has an average academic score of 6.5 and a manual score of 5.6. It is a pertinent sequel to inquire how the students in dentistry compare in scholastic achievement with their fellow candidates for doctoral degrees in allied fields. Though our dental students are admitted within the range of standards that the Harvard Medical School is able to observe and they compete successfully within these standards, their class standings have thus far shown a skewed distribution. For example, in the combined class the dental students stand roughly 10 per cent in the upper third, 30 per cent in the middle third and 60 per cent in the lower third. However, when our dental students are compared with an equal-sized group of candidates for the Ph.D. degree in the medical sciences at Harvard, it is of significance that we find no difference in caliber or performance.

Before turning to a consideration of our clinical instruction, it is important to understand how the program I am about to describe came into being.

The governing bodies which established

Table 1 • Program of Harvard School of Dental Medicine, balanced off in hours

Subjects	HSDM	Distribution of hours suggested for school of dentistry[1]
Basic science	2,333	1,397
Nonbasic science	2,514	3,249
	4,847	4,646

the Harvard School of Dental Medicine did not provide a detailed blueprint of the clinical curriculum. They simply took it as a basic tenet that dental students should have the same grounding in fundamental human sciences as students of medicine. Therefore, the first two years were set aside for this purpose without any compromise and, when the School was opened, two years were available for clinical instruction. Fitting the clinical teaching program into a two year span was left to the ingenuity of an able band of clinical teachers and educators. The apportionment of hours, particularly when clearly they were too few to satisfy all wants, was a painful process. The program as eventually evolved balanced off in hours is shown in Table 1.

Since our program involves a considerable amount of integrated teaching, it is difficult to ascertain precisely the time allotted to given subjects. Moreover, certain disciplines such as dental anatomy, roentgenology and oral pathology are necessarily involved at many points in the total curriculum. Nevertheless, a fair estimate of the time allotted in our program for clinical subjects is shown in Table 2.

Catalog hours are of course a necessary stipulation, but they must be held in proper perspective. Hours are of limited meaningfulness in the teaching-learning equation. A given number of hours of instruction does not equal a quantity of acquired knowledge. The learning process is influenced considerably by such intangible factors as motivation for learning, momentum for self-education, quality of instruction and teaching methods. In the latter connection, the advantage of the tutorial method as an educational device is widely recognized.

Certain of the unique features of the clinical program at Harvard will be discussed. It should be remembered that the clinical staff first meets our students midway in the course of their professional training and that these students have not yet had any instruction in basic dental science. The students, however, having just finished a rigorous two years in the basic sciences, are geared to grueling work habits. By the same token, they are also hungry for clinical experience. They know that they will very shortly be confronted with a patient. Excitement is high and anxiety is just beneath the surface. In the staff also, there prevails a sense of urgency—one that prompts thoroughgoing planning and preparation, and constant searching for greater efficiency in teaching methods.

School opens on the third Monday in September. Introductory instructions are given in clinic procedure and discipline, professional behavior and ideals, personal hygiene and integrity. Each student is then assigned a complete operating unit which he will keep throughout his clinical training for all aspects of dental care ex-

1. Peterson, S. Considerations and suggestions for the development of a school of dentistry at the University of Puerto Rico. Mimeo. Rio Piedras, P.R., University of Puerto Rico, 1955.

Table 2 • Estimate of time allotted for clinical subjects

Subjects	HSDM	Distribution of hours suggested for school of dentistry
Prosthodontics	854	1,000
Operative	466	500
Periodontics	158	230
Orthodontics	338	100
Endodontics	60	68
Roentgenology	50	68

cept surgery. Familiarization of the students with the equipment and instruments is begun immediately. Complete intraoral roentgenograms are taken of each student and these are examined carefully in consultation with an instructor.

On Tuesday, after an introductory lecture on oral examination, each student seats a patient for observation only. He is shown how to hold a mirror and explorer. The main features, such as carious lesions to be filled, stains to be removed and damage to the gingival tissues, are pointed out. The instructors also begin the selection of initial patients for the students and explain to them why each one is suitable. Sterilization procedures are demonstrated and checking of instruments is completed.

Wednesday begins with a second lecture on oral examination, after which the students seat one another, get a further visual acquaintance with the oral cavity, feel the tissues of the mouth and review anatomic landmarks. They also observe stains, calculus, tooth alignment, interdental papillae, and restorations. They are instructed in chair positions, finger rest positions, and how to hold the instruments. They are ready now to learn more about clinic procedure and become acquainted with the clinic record system.

Thursday's lecture is on oral prophylaxis after which the procedure is demonstrated in the clinic on one student per group of five. They then turn to an odontotype mounted on the dental chair and are shown how to scale all tooth surfaces. On Thursday afternoon, the course in dental histology meets for the first time. Friday is taken up with the principles and practice of mouth charting, sessions on the taking of dental and medical histories and further exercise in oral prophylaxis technic. Saturday morning is given over to orthodontics. Here attention focuses on the masticatory apparatus. It is examined in terms of muscular forces and occlusal relations, the classification of occlusion is explained and introduction to the terminology, materials and technics is provided. Again a patient is seated—this time it is a preselected, generally a school-age child with a Class II malocclusion, expectedly correctible without extractions. This is the patient for whom the student will be taking impressions in the week ahead and, except for a fellow student, will be his first patient for oral prophylaxis.

The next few weeks are taken up by concentrated attention to particular subjects for the purpose of speeding the coverage of important elementary instruction and to initiate treatments which are necessarily of long-term nature. The emphasis in the second week is on alginate materials, impression technics, and the pouring and trimming of models. The students first practice impression taking on each other and then on the orthodontic patient. They continue practice in oral prophylaxis and are introduced to the use of the engine in polishing.

The third and fifth weeks are given over mainly to tooth morphology and restoration of tooth form with wax carving.[2] For this exercise each student is required to collect during the preceding summer some 200 to 500 extracted natural teeth, including, if possible, examples of the entire dentition. These are thoroughly cleaned and dried. The students are also expected to have acquainted themselves with previously assigned textual reading in dental anatomy. The extracted teeth are studied until the students can identify them and furnish offhand all the distinguishing characteristics. The students must also name and describe accurately every groove, ridge and fossa.

Next, representative teeth are sectioned to ascertain the size, shape and

2. Van Leeuwen, M. J. Teaching methods in the restorative field of operative dentistry. J. D. Educ. 14:101 Jan. 1950.

position of the pulp chamber and the relative thickness of enamel and dentin throughout the crown. Teeth containing different types of carious lesions are given to the students for restoration of tooth form using inlay wax. Carving technics are discussed and demonstrated. Students start with the simplest lesion and progress to those involving portions of the occlusal surface and finally the entire crown. The experience here will carry over as a basis also for the carving of amalgam restorations and for the preparation of gold inlays.

The fourth week is devoted to orthodontics. The objective is to teach the simplest appliance technic which will achieve the desired result on the patient at hand. Technics are demonstrated on models and illustrated at the chair. By the end of this week most of the students will have fashioned and inserted a simple labial-lingual appliance. Daily lectures and seminars deal with etiology, tissue response to tooth movement, bone physiology and the periodontium, and a beginning is made in consideration of the large topic of normal and abnormal growth and development.[3]

The final sessions on dental anatomy in the fifth week merge smoothly into a detailed consideration of the carious lesion in the sixth. Operative procedures come in at this time with a discussion of the types of carious lesions; that is, smooth surface and pit and fissure lesions and where each type is found. This discussion is liberally illustrated with Kodachrome slides demonstrating the lesions both as they appear in the mouth and in extracted teeth that have been split lengthwise. In the latter instance, the relation of the lesion to pulp disease is pointed out as well as the various changes that have occurred in the pulp and dentin as part of the defense mechanism. The nature, appearance, progression and changing characteristics of the lesion are observed in detail *in situ*. Demonstrations are given in Class I cavity preparations. Student practice in such a preparation is carried out on the chair-mounted odontotype.

Oral histopathology sessions are timed to illustrate the microscopic nature and the pathologic consequence of the lesion. Roentgenographic interpretation, introduced earlier with films of the students' mouths, is now brought to a new level of precision in the identification of carious lesions using in addition films of the teeth of assigned patients. In public health dentistry, the epidemiology of caries is presented as well as the preventive measures and the socioeconomic aspects. Appropriately intermeshing lectures bring the students up-to-date on the progress of experimental work in the field of dental caries at the animal and human levels.

This initial six weeks of work is a launching operation. The instruction is mostly, but not entirely, practical in nature and steeped in basic principles—additional theory will come later. This is the end of the first phase of instruction. The second phase, carrying over to the tenth week, is one of consolidation and of time to correlate new knowledge and to practice technics. Even so, the tempo continues to mount. Periodontics, one half day per week, starts in the sixth week; prosthetic dentistry moves up to four clinic periods per week in the seventh week. The first Class I amalgam restoration is performed for a patient in the eighth week. The technic and application of Class V amalgam and Class II amalgam restorations are to follow at two-week intervals.

Lectures in complete denture prosthesis start in the third week and continue through the first semester. Demonstrations start in the seventh week. The class is divided into three groups. Each group has an instructor and a preselected patient. Discussion starts with the intraoral and extraoral anatomy and with the

3. Cohen, M. I. Teaching of undergraduate orthodontics at the Harvard School of Dental Medicine. Am.J. Orthodont. 43:120 Feb. 1957.

problems created by the edentulous state. Over the next six weeks, the technics required to construct a complete upper and lower denture are demonstrated step by step. The students, using duplicate models of the same patient, perform in like steps the entire procedure. After completion of this "technic case," each student in the group is assigned a patient for whom he will construct a complete upper and lower denture, obtaining only as much help as is necessary. It has been our experience that the first denture requires a goodly amount of assistance, the second and third considerably less, and by graduation the students complete the work almost entirely independently.

In the first week after the holiday recess a number of sound films are interspersed in the regular schedule. These deal with dental materials, matrix bands, rubber dam technic, cavity preparation, and so on. At this juncture, the students are in a position to appreciate these audio-visual aids. These also provide a good review and illustrate variations in technic.

Through most of the remainder of the third year, new material is introduced at points where the student has the foundation to handle it. This includes endodontics, local anesthesia, silicate preparation, indirect gold inlay, partial denture prosthesis, acrylic preparation, pedodontics, nutrition and dental history.

The fourth year is primarily one of practice and of rotational visits to the hospital clinics. The major new courses to be added are fixed partial prosthesis and oral surgery; both start immediately and continue throughout the year. During the spring term dental pharmacology, practice management and dental jurisprudence round out preparation for a professional career.

Some specific features of the School's clinical program are sufficiently out of the ordinary to deserve comment. One of these concerns the wealth of opportunity our students have to gain hospital dental clinic experience. In addition to participating or assisting in dental care at the outpatient level, they have also the opportunity to observe the manifold problems in oral medicine in nonambulatory patients. Most importantly, they learn to appreciate the direct interrelations between oral and systemic disease in a way that is not possible at a dental school clinic. Our students are at an advantage here because they are thoroughly grounded in the biology of disease; they are fresh from full courses relating thereto. In our scheme of dental education, dental or oral medicine occupies an important part of the curriculum and contributes significantly to effective preparation for the rendering of complete oral health service.

Another feature concerns student research. We require each student to undertake and to report on an investigative effort. In the third year this involves selecting a project, reading the background literature, designing an experimental approach and presenting a seminar on the proposed project. At the end of the senior year each student presents a second seminar which deals with results obtained. Considerable freedom is allowed in the choice of project. This activity is viewed as an educational experience and not necessarily as an attempt to advance knowledge, though this has happened repeatedly. This exercise encourages reading, fosters critical evaluation of methods and sparks curiosity. The preparation of reports provides experience in scientific writing, including the preparation of a bibliography. The oral presentation is given before the staff and student body and helps the student to develop ability to think on his feet and to verbalize in public. Nearly all of the investigation is completed outside of the regular curriculum. In advancement of this program, the School's research laboratories have been able to accommodate eight to ten students (mostly juniors) during each summer. The students utilize

part of this time to advance their own projects.

Imaginative teaching is encouraged at all levels, and the student is urged to express his thoughts freely. For instance, each emergency patient is seen first by a senior student. It is his responsibility to examine the patient and to assess his needs. After this, he must present the patient to an instructor in a manner which correlates all of his observations and shows an appreciation of the diagnostic findings. He is urged to use the diagnostic aids in an orderly manner. Before he is allowed to request a roentgenogram he must justify its use and describe what he expects it to reveal. Emphasis is placed on the intelligent use of simple observation and history. This procedure is carried out in the student's own work area, not in a segregated emergency clinic, and it is felt that this helps to encourage a sense of responsibility.

One morning a week throughout the year is reserved for a general diagnostic clinic. All the students and a major portion of the faculty participate. At this session a suitable number and variety of patients are selected for treatment. Since all departments are represented by faculty participants, teaching is first-hand and informal. These periods invariably evolve into small discussion groups which are both lively and informative.

A further feature of the present program is the small class size: 16 in an entering class. There can be no question but that in the early years the flexibility which small classes allowed in the teaching program was a distinct advantage. It permitted wider use of the tutorial or seminar type of teaching and more individual attention in the laboratory and at the chairside. These advantages ceased to be critical when our plan of teaching became stabilized as it has over the past several years. In fact, we are now feeling the disadvantages of small classes and are working to double the enrollment at the earliest possible opportunity. The present class size poses a handicap in student admissions. Moreover, larger classes would utilize teaching strength more efficiently and effectively, and last, but not least, the abundance and variety of the patient pool at the School's clinic would be increased. We would not anticipate any major change in teaching plan to accommodate an entering class of 32 students. Some features of our teaching program are adaptable to much larger classes, others are not. Despite continuing imputations to the contrary, we have been concerned only with a pattern of dental education for our own environment.

I believe I have gone far enough to illustrate a number of the fundamental pedagogical features of the Harvard system. The approach is one which emphasizes the problems of the patient. The general order of consideration is first to fix the student's attention on the basic oral disorder, then on diagnosis and a rational treatment plan. This comes ahead of the materials and the technics that will be employed to achieve the desired result.

The pattern of instruction is discussion of the existing problem followed by presentation of basic principles and objectives of the procedure to be employed; bench demonstration of the technic with emphasis on the part it will play in the proposed treatment; finally, student practice in the laboratory followed immediately by clinical application under the guidance and supervision of an instructor.

The interval from initial consideration of a procedure to clinical application is often two weeks and seldom exceeds four. The time also varies with the individual, and the final step, clinical application, is never taken until the student has demonstrated a degree of competence in the technical procedure satisfactory to the instructor. Every effort is made to coordinate and integrate the teaching of the separate phases of dentistry. This is

achieved both through interdigitating courses and by carrying out several procedures on the same patient, thus bringing instruction in various disciplines of dentistry into common focus. The result of this interlocking of subject material and the reduced time between learning a technic and applying it makes for more effective teaching, heightened motivation, faster learning and better retention.

The instruction is also arranged insofar as is possible so that one basic technic procedure is a stepping stone to the next. Technics are thus not taught as ends but as means to a health service. The system capitalizes on student motivation, immediate clinical application and close supervision. The Harvard program has demonstrated to us that it is possible to effect a great saving in the time required to teach some of the important basic dental technics. There can be little doubt that observations of this nature will become increasingly important to dental education in this age of expanding dental knowledge and changing concepts of dental service.

DISCUSSION SUMMARY

Because it was one of the first public hearings relating to the dental curriculum offered at Harvard, members of the Congress heard Dr. Greep's paper with great interest.

Remarks from the panelists and the audience members of the Congress pointed to some of the advantages of the dental program at Harvard. First, both dental and medical students are given the same training in the basic sciences. Second, because of the emphasis on the theoretical instruction in the basic sciences, the Harvard program is attracting the more exceptional student and thus is maintaining higher-than-average admission standards. Third, the intrinsic nature of the program emphasizes dental research to a high degree. Finally, placing more emphasis in teaching hours on the scientific basis of dentistry than on its clinical skills, the Harvard program represents a very real educational experiment when it is compared with the standard program. Such experimentation is healthy for dental education.

Against these favorable observations were posed some questions. For example, members of the panel doubted that the purposes and objectives of the program had been completely defined and remarked that the observations and evaluation of the program's effectiveness are not yet known publicly. Also, in deliberately catering to the research-minded student, the average dental student was eliminated and forced to apply at other schools. This same selectivity also resulted in a high training cost which very few schools could afford. Another question posing serious problems related to the pooling of medical and dental students for instruction in the basic sciences during the freshman and sophomore years. A clear consensus of discussion participants held that this feature of the program resulted in the loss of dental students to medicine at the beginning of the junior year. Still another question was directed to the deferring of clinical teaching until the junior year. Participants noted that for some students, the determination of ability in the motor-activity phase of clinical practice might be tested too late in the curriculum. Students lacking necessary motor and manipulative skills to continue the dental course would face a major dilemma at this stage of training.

In replying to some of the questions raised by members of the Congress, Dr. Greep explained that the Harvard program attempts to train clinical scholars, educated dentists and thinking individuals who would have the inspiration to be scholars throughout their lives. The objectives of dental education are: to train teachers, to train practicing dentists, to train research workers. At Harvard, equal emphasis is given to all three of these objectives. Dr. Greep further commented on the division of instruction, two years of each, between the basic sciences and clinical dentistry. He defended this division as being necessary, while observing that if other factors permitted, he would favor some clinical teaching for freshman and sophomore dental students. An earlier start with clinical teaching, he thought, might result in a better-timed weeding out of students who lacked the motor skills needed to begin a dental practice. In concluding his remarks, Dr. Greep explained that the mixing of knowledge for dental and medical students was, in his opinion, a desirable goal; a course of study permitting an option for either a medical or a dental degree at the end of the sophomore year, however, was not. Such an option plan has now been discontinued at Harvard and very few losses of this kind have occurred in the last three years. He assured the audience that the Harvard School of Dental Medicine now admits only students who are clearly devoted to dentistry.

PROGRAM BEING PLANNED AT THE SCHOOL OF DENTISTRY, WESTERN RESERVE UNIVERSITY

Paul E. Boyle, D.M.D., Cleveland

The faculty at the School of Dentistry, Western Reserve University, has had less than a year and a half to get acquainted with its new dean and to discuss with him a philosophy of education for the profession of dentistry. We have reached the stage where we agree in the main on certain principles and procedures, and I welcome this opportunity of presenting them for evaluation and criticism.

Our objective is to plan a program whereby students who decide while in high school on dentistry as a career may proceed directly and effectively toward that goal. We are convinced that a period of six years is adequate for the college and professional school educational program culminating in the D.D.S. degree if the student is highly motivated, the curriculum carefully planned, and the staff competent and dedicated. We believe that this program will produce graduates well prepared to enter on the general practice of dentistry. In addition they will have a sound basis for further study to qualify as orthodontists, oral surgeons or for other dental specialties. Finally, they will be prepared to continue education in the biological and physical sciences to supply teachers and research workers for the dental profession.

Currently we are analyzing our present operation, department by department, with the objective of an over-all visualization and understanding of the programs which have grown up in the 65 years of the school's history. The experience of the faculty of medicine, the faculty of the School of Applied Social Sciences, and of the Planning Committee for the University Circle Area have been of great value to us and we have borrowed heavily from their methods.

Our first undertaking was a series of evening staff meetings to which all teachers were invited and at which there were two or three hours of presentation and discussion. Records have been kept and, in many instances, complete tape recordings of the proceedings have been made.

Each department in turn stated its objectives and its present program, including relations with other departments. Problems of staff, equipment, space, time allotted and sequence were presented. The hopes and ambitions of each department for further development were considered.

These discussions included presentations by the departments of the medical school charged with instruction of dental students. Some of the background concerning the relationship of the School of Dentistry to the School of Medicine may be gained from the following quotation from the Report of the Committee on Plans and Development of the Medical School, headed by Dr. John H. Dingle, and published in April 1954:

> The instruction of dental students in basic sciences is at present a responsibility of the School of Medicine and is of direct concern to it. Since the medical faculty is primarily interested in the relation of the basic sciences to medicine rather than to dentistry, instruction is not given as enthusiastically to dental students as to medical students. Furthermore, the reception of such instruction by the dental students often is poor because the application of the basic sciences to dentistry is, in many instances, not obvious. It is evident that the faculty of the School of Dentistry should re-evaluate the scope of knowledge of the basic sciences needed for dentistry and the manner in which they should be presented to dental students. If the basic sciences are important to dentistry, the dental faculty should demonstrate such importance to the students by example, and integrate the basic sciences into the clinical years.

Dean and professor of dental medicine, School of Dentistry, Western Reserve University.

Ideally, the basic science instructors would be directly interested in and trained in the use and application of their disciplines to dentistry. These men should be integrated into the faculty of the School of Dentistry so that they have the opportunity to catalyze the clinical staff with their ideas, interests and enthusiasms. At the same time, however, it is important to maintain such basic science instructors in strong basic science departments so that they may, through association, maintain their excellence and enthusiasm for the basic sciences per se.

It appears unlikely that the School of Dentistry can establish and maintain independently such strong basic science departments, and it therefore seems probable that the instructors in basic science must remain associated with the School of Medicine. Much as it may be desired to have an instructional staff which is engaged in research on dental problems, it is not easy to accomplish this either in the School of Medicine or the School of Dentistry, since few basic scientists engage in or are interested in dental research. The above comments only serve to point out the problems and do not offer a solution. It is clear, however, that both the role of and instruction in basic sciences in the School of Dentistry should be re-examined by that School.

As a continuation of this self-examination, an administrative assistant to the dean, who has had wide administrative experience, is at present engaged in programming facility requirements. The following outline procedure has been sent to all department heads and to other interested persons who are playing important roles in our educational program. It is based in large part on the material used by the Medical School.

PROCEDURE FOR PROGRAMMING FACILITY REQUIREMENTS

I. Defining the Problem • Preliminary interviews with department heads will be held in order:

1. To establish contact for information.
2. To learn the basic problems facing the department.
3. To obtain a preliminary grasp of the whole problem rather than becoming prematurely involved in the detail of any one part.
4. To bring to light at an early date any discrepancies between the desires of the individual departments and the stated philosophy—or basic policy of the school.
5. To develop enthusiasm by furnishing evidence that progress is being made.

These preliminary interviews and meetings will be informal in character. Every effort should be made to bring out a discussion of the general functions and problems of the particular department, stressing items such as:

a. An analysis and a statement of the function of each department with particular regard to its relation to the work of the other department.

b. Any changes in load occurring which might affect future operation of the department or related departments.

c. Any changes in teaching method or technic or program in yours or possibly other departments (schools) of the University.

d. Any noticeable or foreseeable trends in your field affecting your future space requirements.

Although the afore-mentioned procedure may seem unnecessary to the initiated and many of the answers obvious, we think it of value for any complex organization to pause periodically and re-examine its function and operation, which of course, in wider scope was the purpose of the (Dingle) Committee Report.

In these preliminary meetings it is imperative that we stress the importance of attacking the problem from a basic function approach rather than by an impulsive detailed discussion of desired facilities.

In order to preserve the information acquired at these meetings and to avoid misunderstandings, minutes or at least "notes" will be kept and copies sent to those present and to proper departments not actively represented at the particular meeting.

II. Detailed Determination of the Need • To attack the problems more concrete data will be assembled which in turn will be translated into a building program.

We think these data can best be compiled by a written report or list of recommendations by the head of each department given in reply to a questionnaire.

These questions will have been designed to bring out replies leading to the solution of basic problems developed in the preliminary discussions. The replies should include at least:

1. An outline of several possible solutions with indicated preference. For example the following:

a. Change in handling the flow of people or materials through the department.

b. Change in location-arrangement, of equipment and supplies.

c. Combination of related functions in one space.

d. Suggestions for best, most efficient utilization of space.

e. Adding space.

2. An outline of necessary facilities thought to be required to achieve a solution.

3. Various data requested which may differ in the case of each department.

The questions will be introduced to the department head personally and a date set for receiving the replies which will be examined and discussed at subsequent conferences between those concerned, each of whom will have ample opportunity to express himself. From these reports a program will be developed covering the definite requirements to be included in a new building.

III. Development of Preliminary Plans • The development of preliminary plans will consist of actual preparation of plans based on programs developed in the previous phase.

There will be a series of meetings with department heads, architects, consultants and other authorized personnel to gain constructive criticism of the proposed plans.

IV. Conclusions • The foregoing is a method of attack on a complex problem. It is inevitable that certain phases will overlap and that adjustments will have to be made. Without some plan, however, the complexity of the problem could cause its solution to break down into weak localized attacks. In this way we hope to develop a strong, well organized, integrated, medical-dental facility.

From the foregoing it should be clear that we are still in a preliminary phase of the self-appraisal and analysis which will form the basis for sound plans for development.

Now let us turn from the Dental School itself and its relationship to the Medical School to the larger problem of the relationship to the University.

Dentistry, perhaps more than any other learned profession which can properly be taught in a university, has suffered from isolationism and narrow specialization.

What are the remedies we propose to correct this situation?

First, both students and faculty must join the university. We must contribute to and gain from the main stream of learning.

Second, we must provide opportunity for prospective students to experience clinical problems early and relate their broad education to specific objectives.

Third, we must become part of the community as well as the university. We must work with the physician, nurse, social service worker, welfare and other community agencies concerned with the maintenance of health, the care of the sick, and the rehabilitation of the handicapped.

Dentistry has too long been concerned with its own isolated problems, and too little concerned with its contributions to the public welfare.

Specifically we plan to enrich our educational experience by developing an experimental six-year program in cooperation with the undergraduate colleges of the university. It is the latter program which, no doubt, has been responsible for the invitation to make this presentation to the Congress, and I shall devote the

remainder of my discussion to this proposal.

Although it has been accepted in principle by our faculty, and preliminary meetings have been held with representatives of other faculties, the details have not yet been agreed on. Our preliminary thinking is as follows: We gain an impression from interviewing applicants that prospective dental students may be divided roughly into three categories.

First, those who decide early that they wish to be dentists, usually, because of their own experience as a dental patient and admiration for a dentist whom they wish to be like. This decision is often made by the time the student is 12 years of age or even younger. When this decision is resolutely made and strengthened by early contact with the real problems of the profession, we believe it constitutes the firmest basis for continuing education throughout life. This is the professional ideal.

The second category consists of students who have registered in college as premedical students, or they may be premedical and predental students who fail to make a high grade point average. When such students select dentistry, they may be emotionally conditioned against the rigorous discipline traditional in the craftsmanship aspects of dental training.

The third group are those who decide on dentistry after mature experience in the Armed Forces or in other professions. Our experimental program will be primarily designed for the first group.

Our proposal is that from among those students who decide, prior to graduation from high school, on a career in dentistry, a small group, possibly 20, may be selected on the basis of (1) motivation, (2) high school grades, (3) recommendations from high school teachers and others, and (4) aptitude tests.

We have a high degree of selectivity—nearly 500 applicants for 60 available places—and can choose very carefully.

These students would also be admitted to the undergraduate men's college, Adelbert, or women's college, Mather, by the usual procedures and enrolled as special predental students. During the first summer they would be assigned to faculty members of the dental school in groups of two or three. After a period of orientation, they would undertake projects selected with special consideration of their interests, with due regard to furnishing opportunities for contact with patients, and for gaining experience in the skills and knowledge essential to the practice of dentistry.

During the first academic year the students would remain in close contact with their preceptors, who would act as advisers and keep in touch with the student's academic progress. During the second summer period, there would be further experience in dentistry and in research. The observation of orthodontic patients under treatment has been considered as one such experience. The problems of maldevelopment, impairment of speech, and appearance are readily apparent. The fundamental problems of growth and development, genetics, psychology, nutrition and hormonal influences are unlimited and challenging.

Students would start as observers and assistants, eventually becoming hygienists, and assistant therapists. Opportunity for observation over a period of treatment would be afforded. Unlimited research problems, both with patients and laboratory animals suggest themselves. Experience would be gained in the methods of investigation, and all learning would be correlated with the student's objective of becoming an orthodontist.

It is anticipated that a certain number, perhaps many, changed objectives might occur during this time. A student might decide that his basic interests lay elsewhere than in dentistry; for example, in biology, research, medicine, engineering, or law. The sooner this decision is reached on a mature basis of experience, the better for all concerned.

Those who were confirmed in their ambition to become dentists would then be considered for formal admission to the dental school. The entrance requirements would be the same in chemistry, biology or zoology, physics and English, with a minimum number of semester hours as for other applicants. The student would be admitted with considerable knowledge and experience of what dental education involves. The staff would have first-hand knowledge of his personality, aptitude, application and achievement. These students would then constitute an experimental group which could be compared with students admitted on our regular, present plan of operation. They would be expected to take the same lectures and laboratory work, unless excused by the head of the department. They would be required to take all final examinations and also national board examinations. They would be expected, in addition, to continue research investigation under faculty supervision. Student fellowships offered by the Public Health Service and elsewhere would be utilized to further this student activity.

In all subjects, including preclinical technics and clinical areas, qualifying examinations would be set. After the requisite preliminary experience the students would be encouraged to take such qualifying examinations, for example, as would be required of a dental hygienist, of an x-ray technician or a complete denture prosthodontist. At a later stage they would qualify in the use of local anesthetics, in extraction, in precision bridge reconstruction, in periodontics at a preliminary, intermediate and advanced level, in pedodontics, and so on.

Once a student had met the basic requirements, he would then be allowed the privilege of electing special courses in dentistry or in other departments in the University. For all students, the final year would be essentially a supervised general practice year, in which the student would take responsibility for complete dental diagnosis and treatment of selected patients. The use of assistants, ancillary personnel, the acquisition of effective style and work habits would be an important part of professional education. So, too, would working with the student-physician, social service worker, dental laboratory technicians and others.

The average age of our present first year class is 24. Our experimental group as projected would average 24 upon graduation. Ideally they would have entered on formal preparation for dentistry after two years of academic work, supplemented by summer experience in the actual work of the dental profession and with contact throughout the two years with advisors who are dental educators.

It is anticipated that during the six-year period, including the summers, at least as thorough training in dentistry would be secured, and as high a degree of skill attained, as by our present students. (The continuing classes would act essentially as controls for comparison.) We hope to achieve in this group, as compared with the control group, a decidedly above-average interest and attainment in research and the cultural and humanitarian aspects of university life. It is certainly clear that after receiving the D.D.S. degree, the younger students would be in a preferred position to continue in special areas of dentistry such as orthodontics, periodontics or oral surgery. It is also hoped that a significant number of our teachers and research workers would be recruited from among the experimental group.

The resources of the Graduate School of the University are excellent, and cooperation is assured toward the further development of this program which has already produced a number of distinguished teachers in dentistry and dental research.

In summary, then, our plan is to offer a program for the exceptionally gifted high school graduate who has decided on dentistry as a career; that he be accepted

into the University as a predental student with the intention of qualifying for admission to the dental school proper two years later; that a six-week summer period be utilized for gaining experience in dentistry as such, together with project experience in research, which concerns the biological, biophysical, or mechanical aspects of dentistry; that those who are admitted at the end of the two-year period to the dental school constitute an experimental group to be compared over a four-year period (and subsequently in their professional careers) with the remainder of the class selected according to our present, standard procedures.

Data would be collected as to achievement, clinically, scholastically, and in research while in the school. We would note the number continuing in careers as teachers, research workers, and specialists, the number in each group failing to graduate who dropped out of the profession, so that evaluation of this relatively young group could be made with the older group.

Should the six-year period prove satisfactory or superior, it might eventually be adopted as our preferred method of education for the profession of dentistry.

DISCUSSION SUMMARY

The scheduled position on the program of Dr. Boyle's paper, the last of the three papers in the morning session, unfortunately resulted in some curtailment of the discussion period which followed immediately. Nevertheless, and in a shorter period than had been allocated to the two preceding papers, both interest and discussion of the experiment to be tried at the Western Reserve School of Dentistry was lively and thoughtful.

In outlining a program not yet in operation at his school, Dr. Boyle was confronted with two types of questions: questions having a plain, factual basis and questions relating to the educational philosophy of the school. At the informational level, Dr. Boyle was asked to list the objectives of this program and to show in more detail what the intrinsically new features were. He also was asked to explain further the ways in which this training program was better than that used by the majority of the schools.

Since the program involves departures from the more traditional dental curriculum, Dr. Boyle was also confronted with questions of a broader, conceptual nature. Since this program proposed a blending of the liberal arts courses with the scientific and clinical courses, over a projected six-year period, one inquirer asked whether the liberal arts faculty or the dental school faculty would be more competent to teach courses in the humanities and social sciences. Did Dr. Boyle suggest that the Western Reserve program would not follow these traditional paths?

Another inquirer requested a statement from Dr. Boyle to clarify his understanding of the relationship and importance of the humanities to dental education. The question of leadership training was also raised. Can leaders be trained for dentistry by emphasizing the humanities rather than the basic sciences?

The lateness of the hour prevented Dr. Boyle from answering each of the questions which had been directed to him. In a general restatement of his views and in an effort to furnish in some measure, answers to specific questions, Dr. Boyle commented that the Western Reserve program was in essence attempting to lay a broader foundation for dental education than the present, traditional course requires. The innovation in this program, although staying within curriculum boundaries established by the Council on Dental Education and examining groups, involves an introduction of dental interests and studies during the preprofessional or predental period of study. Student's attention will be directed to dentistry while yet studying literature, history, psychology and other subjects in the humanities area. Dr. Boyle noted a similarity of the Western Reserve program to both the California and Harvard programs and commented that at Western Reserve, the dental student was given early what at Harvard was given late; that is, some introduction to clinical dentistry and the sciences relating to it would be offered to predental students and that a desired result would be a more thorough exposure to dentistry through a six-year, rather than four-year training program.

Dr. Boyle concluded his summary by observing that the program he was describing was still being formulated. The basic objective is to make the dental school an integral part of the university. There is no question about the relative competence of specialists in the humanities, social sciences, or indeed in the physical sciences or biologic sciences to teach courses in their particular areas. The question is how are these ever expanding fields of

knowledge, any one of which could challenge a lifetime of scholarly endeavor, to be related to the education of a dentist within a reasonable part of his expected life span.

Toward this end it is important that every teacher be acquainted with the broad outlines and principles of the courses given by every other teacher, not only in the clinical areas but in the humanities and the sciences. Clinical teaching and practice must respect and exemplify such principles. Integration must not be left to the student himself or to the curriculum committee; it must be the concern of everyone who comes in contact with the student-dentist.

The immediate objectives are three.

1. To enable the exceptionally able student, who decides early on dentistry as a career, to enter on his professional education at a relatively young age when skills are most easily acquired.

2. To continue contact with the sciences and humanities throughout his period of study in the university.

3. To lay a foundation for continuing study throughout a professional career in dentistry as well as forming a realistic basis for continuing education for the dental specialties or for teaching and research.

GENERAL OBSERVATIONS ON EXPERIMENTAL DENTAL EDUCATION PROGRAMS

As the moderator for the afternoon session of the Congress, Dr. Fleming concluded the meeting with a general summary statement. He observed that the profession can take pride, through such programs as this, in its acceptance of increasing responsibilities to the public and itself. The speakers and all other participants demonstrated the adaptability of the profession to new programs. Dentistry, in a gradual development over the last 100 years, has turned its concern from the relief of pain, to the control and elimination of infection, and now regards the prevention of disease as its primary mission. In this evolution of purpose is seen the profession's ability to meet the changing needs of the future.

In his closing summary remarks, Dr. Fleming described three central themes that were suggested by the conference discussions. The first demonstrated dentistry's concern with improved teaching. The second reflected the profession's determination to avert a threatened manpower shortage. The third displayed its interest in broadening its educational base. In all of dentistry's experimental teaching programs, the profession's adaptability to new ideas and its educational leadership might be interpreted as signs of general health and well-being.

COUNCIL ON DENTAL RESEARCH

Research division: American Dental Association National Institutes of Health

Edward G. Hampp, D.D.S., M.S., Bethesda, Md.

The research associates of the American Dental Association at the National Institute of Dental Research have continued and expanded the research program in the field of oral diseases. Certain phases of the program are being conducted in cooperation with other investigators of the National Institutes of Health. The four research associates participating in this program are Edward G. Hampp, John E. Folk, Ph.D., Tetsuo Shiota, Ph.D., and Stuart A. Narrod, Ph.D.

ORAL MICROBIOLOGY

A clinical investigation is being conducted by Mr. Morrison Rogosa, Dr. Hampp and Thomas A. Nevin, Ph.D., on blood culturing of patients after oral surgery (exodontia) and periodontal treatments (curettage). The purpose of this study is to investigate the incidence of bacteremias after oral operative procedures, the types of organisms thus obtained, the relationship of such organisms to systemic infections, to determine optimal conditions for blood culturing procedures using the isolates thus obtained for such purposes and to apply this knowledge in the study of modifications of dental surgical technic to minimize such bacteremias. To date, 67 patients have been studied with 57, or 85 per cent, showing positive blood cultures. Control bleedings were done prior to operation in all instances. Thus far, 115 isolates have been obtained representing at least 11 genera, and they have been studied during this period by means of 40 tests for each strain of organisms. These data are being assembled and studied for characterization of the species. The blood culture technics and media employed in this study, when compared with those widely used by hospitals of high standards, have shown that the recovery rate of organisms is over twice that of present hospital methods.

In addition, Dr. Hampp and Mr. Rogosa have initiated a study of the serologic aspects of the oral Veillonella. Although the biochemistry and nutritional requirements of these organisms have been established by Mr. Rogosa, there is still a need for a suitable method for classification purposes. For this investigation, 50 established strains of Veillonella are being employed that have been categorized into groups on the basis of nutritional studies. Antiserums have been prepared and preliminary macroscopic agglutination tests have been performed.

In addition, Drs. Nevin, Hampp and Shiota have initiated a study on the dynamics of the oral bacterial flora by investigating the interactions between the various members of the flora. The fastidious organisms of the mouth such as spirochetes, spirilla and various filamentous organisms will be used to discover less fastidious microorganisms whose products are required by, or enhance the growth of the more exacting types. On screening a variety of organisms for activity affecting the growth of spirochetes, an anaerobic diphtheroid was isolated that proved to be noticeably

stimulatory to a strain of *Borrelia vincentii*. Further study of the interaction requires a more complete knowledge of the nutrition of the Borrelia. To this end, the requirement of the spirochetes for ascitic fluid or other natural materials is being investigated. Thus far, qualitative tests indicate the presence of an organic phosphate in ascitic fluid for which glucose-1-phosphate can be substituted. The hexosephosphate does not permit maximal growth of the spirochetes in an otherwise adequate medium; however, it is the first successful substitution of a single known compound for natural materials.

In the field of the spirochetes, Dr. Hampp and Robert J. Fitzgerald, Ph.D. are employing pure cultures of the smaller oral treponemes, *Borrelia buccalis* and *B. vincentii* in an investigation of the *in vitro* effects of certain of the newer antibiotics. This work is about completed. During this period, these investigators initiated a new problem on the use of germ-free guinea pigs for studying the virulence of the oral Treponema and Borrelia. In addition, Dr. Hampp has begun a new study on the occurrence of spirochetes in spinal fluids of persons with multiple sclerosis as reported by Ichelson.[1] Because of the importance of Ichelson's observation regarding a disease of unknown etiology and the broad experience of Dr. Hampp in the field of spirochetes, it was felt that this report warranted confirmatory evidence. To date, 22 spinal fluids from patients in whom multiple sclerosis has been established have been cultured by methods reported by Ichelson without confirmation of her findings. In addition, four cultures of "multiple sclerosis organisms" kindly supplied by Miss Ichelson were studied culturally and by darkfield and stained smear preparations. Morphologically none of the organisms studied possessed characteristics typical of spirochetes. Further studies are in progress.

Currently, Dr. Shiota is working on two major projects: one deals with the microbiology of saliva and the other with the nutrition and metabolism of lactic acid bacteria.

The objectives of the first project are to study the quantitative bacterial content of saliva, certain oral environmental effects on the *in vitro* bacterial and chemical changes in saliva, the origin and content of bacterial growth promoting factors in saliva and the dynamic interaction of oral microorganisms. The effects of glucose, lactate and pH exhibit a considerable influence on *in vitro* bacterial and chemical composition of saliva. For instance, in unaltered whole saliva, the fusobacteria are the only organisms, of those studied, to increase in numbers. On the other hand, the addition of glucose caused a rapid death of the fusobacteria and the growth of lactobacilli and Veillonella. Ammonia and indole which were formed rapidly in unaltered saliva were completely inhibited by glucose. Another change which occurred in incubated whole saliva was an increase in the B vitamin levels. In parotid secretions, however, the vitamin levels were either very low or nil and there was no increase in their levels as the result of incubation. Preliminary observations suggest that the increase of salivary vitamins is the result of bacterial synthesis.

The second project on amino acid and vitamin metabolism is being done in conjunction with Dr. Folk and is concerned with the synthesis of folic acid-like compounds. The enzymatic synthesis of folic acid-like compounds was demonstrated using extracts of *Lactobacillus arabinosus*. The compounds required for synthesis were reduced pteridine, p-aminobenzoic acid or p-aminobenzoylglutamic acid, adenosinetriphosphate and magnesium.

A cooperative study is being carried on by Dr. Folk, Karl A. Piez, Ph.D., Dr. Shiota and Frank Tietze, Ph.D., to study peptide utilization for protein synthesis by *Lactobacillus arabinosus* and *Leuco-*

1. Ichelson, R. R. Cultivation of spirochaetes from spinal fluids of multiple sclerosis cases and negative controls. Proc. Soc. Exper. Biol. & Med. 95:57 May 1957.

nostoc mesenteroides. Previous findings indicated that lysine utilization by these organisms was competitively inhibited by a lysine analogue. This inhibition was alleviated by certain lysine-containing peptides in a manner suggesting the utilization of these peptides prior to hydrolysis. This observation is being investigated by employing a radioactive peptide which will provide information on the manner in which this material is utilized for protein synthesis.

BIOCHEMISTRY

The investigations for the past few months by Dr. Folk on carboxypeptidase-B have been directed toward the mode of action and the specificity for protein and polypeptide substrates. A search for specific competitive inhibitors for this enzyme has been rewarding and it is recognized that certain specific chemical structures are required for enzyme action. A second particularly important point in understanding the mode of action is whether or not the enzyme possesses esterase action. Ester substrates are in various stages of preparation and will be tested soon. More recently, studies in specificity have been directed toward c-terminal basic amino acids of the fibrinopeptides as a portion of a study on the basic mechanism of blood clotting. Dr. Folk is working on this problem in cooperation with Jules A. Gladner, Ph.D., and Koloman Laki, Ph.D., and attention is focused on the elucidation of the structure of the active center of thrombin, the specificity of thrombin and the structure and physiological properties of the products formed by the action of thrombin on fibrinogen. By employing radioactive phosphoryl derivatives of thrombin, it has been learned that the amino acid sequence of the active center surrounding serine of this enzyme is identical to that of chymotrypsin and possibly trypsin. Structure studies on the fibrinopeptides are under way, and polypeptide substrates for thrombin, containing arginine and lysine moieties, are in various steps of preparation and will soon be ready for testing.

Currently two main projects are being conducted by Dr. Narrod in relation to structural integrity and general metabolism of biological systems which are applicable to dental supportive tissue.

The first project is being conducted in conjunction with Robert R. Omata, Ph.D., and involves an enzymological study of collagen using the collagenase produced by *Clostridium histolyticum*. This group of enzymes is being fractionated into its component parts to provide information basic to the nature and structure of collagen (the protein matrix of bone and dentin). In addition to the fraction procedures already reported, a sponge electrophoresis system has been successfully employed. The partially purified enzyme has been found to be stable at two different pH levels on the preparative electrophoresis and to have different mobilities in each. Thus, an effort is now being made to combine these two steps for further fractionation of the collagenase.

The other project concerns metabolism of two carbon compounds which are basic to general tissue function. An organism has been obtained by enrichment technics capable of growing on ethanolamine (a two carbon compound) for its sole source of carbon and nitrogen. Studies of the metabolic pathway in this organism have indicated that glycoaldehyde is the first compound formed. In the course of this investigation, an extremely sensitive chemical test for aldehydes has been developed.

PUBLICATIONS

Recent and forthcoming publications by research associates include the following:

1. Tietze, F.; Gladner, J. A., and Folk, J. E. Release of c-terminal S-(β-aminoethyl)-cysteine residues by carboxypeptidase-B. Biochem. et Biophys. Acta. 26:659 Dec. 1957.

2. Folk, J. E., and Gladner, J. A. Carboxypeptidase-B I. Purification of the zymogen and specificity of the enzyme. J. Biol. Chem. (In press)

3. Gladner, J. A., and Folk, J. E. Carboxypeptidase-B II. Mode of action on protein substrates and its application for carboxyl terminal group analysis. J. Biol. Chem. (In press)

4. Hampp, E. G. Isolation and cultivation of spirochetes obtained from unexposed canals of pulp-involved teeth. Oral Surg., Oral Med. and Oral Path. 10:1100 Oct. 1957.

5. Shiota, T. Effect of fluoride, iodoacetic acid, penicillin, sodium lauroyl sarcosinate and dehydroacetic acid on certain oral bacteria of white rats fed a smooth surface caries diet: preliminary report. J.A.D.A. 55:205 Aug. 1957.

6. Shiota, T., and Kunkel, M. F., Jr. *In vitro* chemical and bacterial changes in saliva. J. D. Res. (In press)

7. Shiota, T.; Folk, J. E., and Tietze, F. Inhibition of lysine utilization in bacteria by S-(β-aminoethyl)-cysteine and its reversal by lysine peptides. J. Biol. Chem. (In press)

Supplement to the list of certified dental materials

ADDITIONS • Since publication of the most recent List of Certified Dental Materials, Revised to April 1, 1958 (J.A.D.A. 56:752 May 1958), the following materials which conform to the American Dental Association Specification No. 6 for Mercuries and Specification No. 12 for Denture Base Resins have been added.

CERTIFIED DENTAL MERCURIES
(A.D.A. SPECIFICATION NO. 6)

Mercury	*Manufacturer or distributor*
Mercury, Triple Distilled-C.P.	Laboratory Products Company

CERTIFIED DENTURE BASE RESINS
(A.D.A. SPECIFICATION NO. 12, SECOND REVISION)
TYPE I, HEAT-CURING

Material	*Form*	*Manufacturer or distributor*
Vernonite Chromavein	Pink; plastic cake	Vernon-Benshoff Co.

SURVEY • From time to time, products on the List of Certified Dental Materials are tested for continued compliance with American Dental Association specifications. Samples of the certified silicate cements were tested by the American Dental Association Research Division at the National Bureau of Standards under the supervision of that Bureau. The following certified materials were found to comply with the specification. This list supersedes that published in the May 1958 issue of THE JOURNAL.

CERTIFIED DENTAL SILICATE CEMENTS
(A.D.A. SPECIFICATION NO. 9, FIRST REVISION)

Cement	*Manufacturer or distributor*
Ames Plastic Porcelain	The W. V-B. Ames Co.
Astralit	Premier Dental Products Co.
Baker Plastic Porcelain	Baker & Co., Inc.
DeTrey's Synthetic Porcelain; Syntrex	The L. D. Caulk Co.
Durodent Enamel	Oskar Schaefer
Smith's Certified Enamel Improved	Lee Smith Co.
S.S. White Filling Porcelain Improved	The S.S. White Dental Mfg. Co.

COUNCIL ON DENTAL HEALTH
COUNCIL ON LEGISLATION

The Forand Bill—a proposal to finance health care for the aged under O.A.S.I.

Hal M. Christensen, LL.B., Chicago

On August 27, 1957, Representative Aime J. Forand of Rhode Island introduced in Congress a bill, H.R. 9467, which has as its main purpose the establishment of a health care program within the O.A.S.I. provisions of the Social Security Act.

Since then, the bill has been the subject of a great deal of comment and activity within all the major health organizations. Scarcely a week has passed that the publications of some of these organizations or the "health trade press" have not contained articles or editorials dealing with the Forand bill. Certainly, nothing since the compulsory health insurance proposals of 1950 has aroused so much spirited controversy among interested groups.

In view of the fact that legislative proposals similar to the Forand bill have been introduced and then been forgotten in practically every Congress since 1950, the reason for all the furor is not entirely clear. Part of the explanation for the wide attention given the bill may lie in the fact that Congressman Forand holds an important position on the Ways and Means Committee which has the bill under consideration. Or, perhaps, the quick endorsement of the bill by George Meany, president of the AFL-CIO, or the rapid denouncement of the bill by some of the health organizations accounts for the voluble reaction. In any event, for whatever reason, the Forand bill has developed into a full-fledged issue which must be confronted and dealt with.

The bill would increase the benefits payable under the federal old-age, survivors, and disability insurance program and would provide insurance against the costs of hospital, nursing home, and surgical service for persons eligible for old-age and survivors insurance benefits. Social security taxes would be increased appreciably to finance the new benefits.

Since the Association's primary concern relates to those provisions of the bill dealing with health care, it is not proposed to cover, in this paper, the sections of the bill relating to increases in existing social security benefits and taxes.

The bill provides for payment of the cost of certain hospital, nursing home and surgical services for persons receiving O.A.S.I. benefits and for persons who would be eligible for benefits if they applied. Thus, men over 65 and women over 62 would be entitled to health care benefits even though they were not retired, provided they had made sufficient contributions in covered employment or self-employment. Congressman Forand estimates that "12 or 13 million persons would receive the protection" of health care payments the first year.

Under the bill, a person could receive up to 120 days a year of combined hospital and nursing home care, but only 60 of those days could consist of hospital service. The hospital services would include semi-private accommodations, bed,

Presented before the Ninth National Dental Health Conference, American Dental Association, Chicago, April 28-30, 1958.

Assistant secretary, Council on Legislation.

board, drugs and such other related services as are customarily provided for bed patients by licensed hospitals.

Nursing home services would be provided only if a person had been transferred to the nursing home from a hospital on a physician's certification. Only licensed nursing homes which are connected with a hospital or are operated by physicians would be qualified to provide services.

Surgical services would include surgical procedures including oral surgery provided in a hospital and emergency surgery performed in the out-patient department of a hospital or in a doctor's office. In other than emergency cases, a person would have his choice of a hospital or nursing home provided he had been referred there by a physician or dentist upon a determination that care by such an institution was medically necessary. (It might be noted that the surgical services described in the bill resemble closely the benefits provided in typical Blue Shield contracts.)

Agreements for the provision of hospital and nursing home care would be entered into between the Secretary of Health, Education and Welfare and institutions licensed under state law. Likewise, agreements for provision of surgical services would be entered into with physicians and dentists or with associations or organizations authorized to act in behalf of such physicians and dentists. Such agreements would stipulate the rates of payment for surgical services and would provide that the rate of payment agreed on would constitute full payment for any service performed.

Payments for services would be made from the O.A.S.I. Trust Fund.

In administering the program, the Secretary would consult with a National Advisory Council composed of the Commissioner of Social Security and eight members to be appointed by the Secretary. Four of the appointed members would be persons who are outstanding in fields pertaining to hospital and health activities and four would be appointed to represent the consumers of hospital, nursing home, and surgical services.

Those, in brief, are the important provisions of the bill relating to health care. Many of the mechanics of administration would, of course, be left for implementation by the Secretary through issuance of regulations.

In passing, it should be noted that substantial costs would be incurred in providing health care on the scale contemplated in the bill. Congressman Forand estimates that "the improvements averaged over a long period of time, in the usual manner, would equal about 1 per cent of payrolls on an intermediate cost assumption." It is believed that 1 per cent is an ultraconservative estimate, but as yet no complete cost analysis is available.

POLICY CONSIDERATIONS

In the interests of objectivity, it probably should be conceded at the outset that Congressman Forand, in introducing and promoting his bill, has been motivated by a desire to bring adequate health care to a segment of the population which includes persons who may not be able to afford such care.

By making that concession, it can be agreed that Congressman Forand and the American Dental Association have a common objective. One of the major missions of the American Dental Association is to assure, to the greatest extent possible, that dental care is available to all the people of this nation, regardless of income, geographic location, or any other factor. Toward the accomplishment of that end, the majority of the Association's programs are dedicated.

Thus, there can be no quarrel with Mr. Forand's purpose; the only question presented is whether the means which he proposes for attaining the objective are practical and desirable. The American

Dental Association's answer to that question can be found in the first paragraph of a policy statement, adopted recently by the Association's Board of Trustees, as follows:

> The plan for providing personal health care benefits to O.A.S.I. beneficiaries within the Forand proposal (H.R. 9467) and similar bills is in conflict with the Association's principles governing federal support of personal health care programs.

The Association's policy was reached only after thorough deliberation and study of all the considerations involved including, specifically, the plight of aged persons who may not be able to bear the costs of adequate health care. With due regard for, and in full recognition of the fact that deficiencies may exist in the availability of adequate health care for some of our older citizens, the Association is convinced that the Forand plan does not provide a satisfactory or desirable solution to the problem.

The Forand proposal to include health care benefits under O.A.S.I. is not a new approach; it differs only in degree from the compulsory health insurance proposals which were promoted so vigorously during the period from 1943 through 1950. But for the provision of fewer benefits for a smaller segment of the population, the Forand bill is almost identical to the Murray-Dingell bill which was thoroughly debated and rejected eight years ago. The arguments which then were asserted against that legislation apply with equal force to the Forand bill of today.

Implicit in these kinds of plans is the establishment of a vast and costly administrative mechanism with all the regimentation that entails. Such an arrangement cannot help but disturb the relationship between patient and practitioner, and restrict the right of individuals to avail themselves of the services of practitioners of their choice.

In addition, experience with the Forand type of plan in other government agencies has pointed up serious flaws and weaknesses. Almost without exception, the government underestimates the potential cost of the services to be provided, and this results either in reductions or limitations of such services, or in reductions in the compensation paid to the providers of the services, or both. This leads inevitably to the withdrawal of practitioners from the program and ultimately to the diminution of the quality of care provided. These untoward results have occurred in the VA program and in other government programs. Unquestionably, similar defects would appear if the Forand plan is enacted.

There are other reasons for believing that enactment of the Forand bill would be unwise. Great strides have been made in the last few years in the field of preventive dental research. This has been due largely to substantial increases in federal funds made available for this purpose. There is reason to expect that the drain on the treasury resulting from support of health care under the Forand plan would react to the financial detriment of dental and medical research programs as well as existing public health programs.

Additionally, and very importantly, there is the grave question of whether under our system the government should undertake to provide health care for large segments of the general population in the absence of a special relationship, a special responsibility, or a demonstration of economic need.

With respect to O.A.S.I. beneficiaries as a class, the government bears no special responsibility, has no special relationship and to date there is no proof that all O.A.S.I. beneficiaries are unable to finance their own health care.

It is believed that a line can be drawn between health care programs which may properly be undertaken by the government and those which should be left as the primary responsibility of the private citizens of this nation.

The American Dental Association has attempted to chart such a line in the policy statement which was adopted for application to the Forand bill.

That policy recognizes fully that there are certain areas in which the government has a responsibility to act or is exercising its legitimate prerogatives in acting to provide health care or financial support of health care for limited segments of the American public. Included within these segments are:

1. Persons toward whom the government bears a direct and special responsibility, such as military personnel or former military personnel who have suffered disabilities in connection with military service.

2. Persons, such as civilian employees with respect to whom the government has a special relationship, provided it is decided by the government to purchase health care benefits from private sources as a part of the employment contract.

3. Dependents of persons in the aforementioned two categories, should the government decide to purchase private health care as an extra emolument of government service.

4. Indigent persons through state and local public assistance programs.

The Forand plan would add to these four categories a fifth, which includes many people who are not in need of financial support for health care and who occupy no special position in relation to the government. There would appear to be no sound reason for extending government-sponsored health care in this fashion.

O.A.S.I. beneficiaries who are unable to finance their own health care can be provided for under the framework of existing state and local welfare health programs supported by federal grant-in-aid contributions. For many reasons, this method is far superior to the scheme contained in the Forand bill. Under public assistance programs as they are operated today, health care can be made available directly to those who need it most; because public assistance is related directly to need, it is the most economical and effective method.

If there are large numbers of aged persons who are not receiving the health care they need because of economic reasons, public assistance should be expanded to help them, but this should be the outside limit of direct government sponsorship.

Federal participation in and control of health care programs beyond this undoubtedly will impede the growth of private health and welfare plans and other private programs which are being extended, in increasing numbers, to cover persons who have reached retirement age.

Given the opportunity, it is believed that through the advances which are being made in promoting additional private health care plans, in providing better education and producing increasing numbers of practitioners, in fostering preventive research and finally, in supporting public assistance based on need, the gaps which now exist in the availability of health care will be closed. If these gaps are closed, the Forand bill and others like it will become dead issues.

BUREAU OF LIBRARY AND INDEXING SERVICE

Additions to the Library

The books listed here have been added recently to the Library collection. Requests for this material, available on loan to all members of the Association, should be addressed to the Bureau of Library and Indexing Service. There is no charge for borrowing these books. Most of these books may be purchased also through the Bureau. In addition practically all the dental journals published in the world at present are available to members on loan. Lists of books and package libraries are also available on request.

BOOKS

ADAMS, C. P. The design and construction of removable orthodontic appliances. 2d ed. Bristol, Wright, 1957. 118 p. $5.50.

AMERICAN COLLEGE OF RADIOLOGY. A practical manual on the medical and dental use of x-rays with control of radiation hazards. Chicago, 1958. 31 p. $0.25. (Sponsored by American Dental Association.)

AMERICAN DENTAL ASSOCIATION. Specifications for dental materials, prepared by George C. Paffenbarger, John W. Stanford and W. T. Sweeney for the Council on Dental Research, American Dental Association. 3d ed. Chicago, 1958. 84 p. $2.25.

AMERICAN DENTAL ASSOCIATION. BUREAU OF DENTAL HEALTH EDUCATION. Dental health facts for teachers. Chicago, 1958. 31 p.

AMERICAN DENTAL ASSOCIATION. COUNCIL ON INTERNATIONAL RELATIONS. Graduates of U. S. dental schools practicing abroad. Chicago, 1957. 44 p. Mimeo.

AMERICAN SOCIETY OF DENTAL SURGEONS. Minute book 1840-1856. 324 p. On microfilm only.

ARCHER, W. H. A manual of dental anesthesia; an illustrated guide for student and practitioner. 2d ed. Philadelphia, Saunders, 1958. 346 p. $8.50.

ARKANSAS STATE DENTAL ASSOCIATION. A guide for dental health consultants, by Arkansas State Dental Association in cooperation with the Division of Dental Health, Arkansas State Board of Health. Little Rock, 1957. 18 p.

THE AUDIO-VISUAL DIRECTORY. 4th ed. Fairfax, Va., National Audio-Visual Association, 1958. 224 p. $4.25.

BIRD, BRIAN. Talking with patients. Philadelphia, Lippincott, 1955. 154 p. $3.

BRITISH SOCIETY FOR THE STUDY OF ORTHODONTICS. Transactions, 1956. London, Wright, 1958. 198 p.

CALIFORNIA STATE DEPARTMENT OF PUBLIC HEALTH. DIVISION OF DENTAL HEALTH. Dental caries survey of California school children; sixteen non-fluoride cities 1952-1956. Berkeley, 1957. 9 p. Mimeo.

CARR, J. D. History of the Central College of Dentistry, Indianapolis, Indiana 1897-1905. Thesis—College of Education, Butler University. Indianapolis, 1957. 44 p. Mimeo.

CRESPI, R. A. Prótesis parcial movible. 3d ed. Buenos Aires, Centro Estudiantes de Odontología, 1957. 139 p.

DAVID, J. H. S. Antropometria da tribo Caconga. Lisbon, Companhia de Diamantes de Angola, 1958. 114 p.

DENTON, G. B. The vocabulary of dentistry and oral science; a manual for the study of dental nomenclature. Chicago, American Dental Association, 1958. 207 p. $4.

DURANTE AVELLANAL, CIRO. Diccionario odontológico. Coloboro Marta Irma Durante. Buenos Aires, Ediar, 1955. 739 p.

ENGLISH, O. S. & PEARSON, G. H. J. Emotional problems of living; avoiding the neurotic pattern. Rev. and enl. ed. New York, Norton, 1955. 592 p. $5.95.

ESDAILE, JAMES. Hypnosis in medicine and surgery. Introduction and supplemental reports on hypno-anesthesia, by William S. Kroger. New York, Institute for Research in Hypnosis Publication Society, 1957. 259 p. $4.

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American Dental Association Film Library

The films, "The Bite Plane," "Children with Cleft Palates," "Use of Chrome Steel Crowns in Dentistry for Children;" the slide set, "The American Dental Association," and the filmstrip, "Preparing Your Child for Medical and Dental Care," recently have been added to the American Dental Association Film Library collection. A Mimeographed supplement to *Audio-Visual Materials in Dentistry* lists other recent additions to the film collection.

FILM REVIEWS

The Bite Plane (An Adjunct in the Treatment of Periodontal Disease) • 16 mm., color, sound, 20 minutes. Produced in 1955 by Abraham Berliner, D.M.D. Photography by John Carroll. Rental $2.50. Purchase arrangements through producer at 30 Central Park South, New York 19.

An informational film suitable for stimulating more individual research on the subject. The idea of the inseparable relation of form and function is presented in a series of case reports. The film sequences demonstrate the classification, fabrication and indications for the six classes of bite plane used adjunctively in the treatment of periodontal disease. Postoperative follow-up of two to nine years after normal completion of treatment is shown. The material is interesting and informative; the presentation is a bit rapid but well done.

Children with Cleft Palates (A Program of Speech Development) • 16 mm., color, sound, 28 minutes. Produced in 1956 by H. Harlan Bloomer, University of Michigan, Audio-Visual Education Center, Ann Arbor, Michigan. Rental $2.50. Producer may be contacted for purchase.

An informational film that illustrates the procedures which should be followed to encourage the development of good speech in children with cleft lip and palate. A general outline of treatment according to the ages and developmental growth periods of the children is shown. The interrelationship of medical, dental, psychological, and speech correction services is discussed. Information on oral embryology and common types of oral clefts are shown. The function of the hard and soft palates are visualized by cineroentgenography. The emphasis is on a program of treatment and speech development for the child born with an oral cleft. The film is intended for parents and professional groups.

The Use of Chrome Steel Crowns in Dentistry for Children • 16 mm., color, sound, 16 minutes. Produced in 1957 by William P. Humphrey, D.D.S. Rental $2.50. Available for purchase through producer at 390 University Blvd., Denver 6, Colo.

A demonstration film showing the use and advantages of chrome alloy crowns. The preparation of the tooth and technic of adaptation of deciduous molar crowns is detailed. Diagrams are used in demonstrating the preparation of the surfaces with a diamond wheel. The selection of a preformed crown is made and the adaptation is shown in some detail. The finished crown extends to the gingival margin and is cemented in place. The advertising of the advantages of chrome alloy steel crowns is apparent. The photographic quality is good and although the technics are not new, the content is of interest.

Preparing Your Child for Medical and Dental Care • Filmstrip, color, speakers guide, 37 frames. Produced by the National Film Board of Canada. Rental $1.50. Available for purchase from The Stanley Bowmar Company, Valhalla, N. Y., $5.

A parent information filmstrip to show how children develop sound attitudes toward doctors, dentists and hospitals. A discussion of the development of fears and the thoughtless remarks of parents is followed by concrete suggestions for the proper introduction of the child to the health services. The reference to dentistry is limited but provides a springboard for further discussion. Captions on the drawings supplement the speechnotes which accompany the filmstrip. (A set of 2 by 2 slides of the same material is available if a filmstrip projector cannot be obtained.)

The American Dental Association • 2 by 2 slides, color, speakers guide, 22 slides. Produced by the American Dental Association, 1958. Available on free loan from the Film Library.

A presentation of the activities and services of the American Dental Association and the way it is organized to deal with the major problems of the dental profession.

Book Reviews

STANDARD NOMENCLATURE OF DISEASES AND OPERATIONS

Edited by Richard J. Plunkett and Adaline C. Hayden. Fourth edition. 1,034 pages. Double index. $8. Chicago, American Medical Association, 1952. Supplement, 1957.

This excellent compendium of the terms used in medical and dental diagnosis and surgical treatment is unusually complete for a single-volume work. Many well-qualified authors from various medical specialties have contributed to this attempt to form a classification and standardization of the nomenclature. Dentistry is represented by Maynard K. Hine, George B. Denton and Lon W. Morrey. It appears, however, that in the Appendix to the Standard Nomenclature and International Statistical Classification and in the Supplementary List of Changes Made Since Publication of the Fourth Edition, dentistry and oral surgery are neglected.

Preface, introduction, instructions to librarians, schema of classification, list of nondiagnostic terms for hospital record, and the anesthesia section contain excellent, almost philosophical, discussions.

This work can be enthusiastically endorsed as a useful reference book for dental specialists and practitioners as well as for dental students. The indexes are detailed and accurate. Binding, printing and paper are of high quality.

Paul H. Glucksman

KLINISCHE FUNKTIONSDIAGNOSTIK (CLINICAL DIAGNOSIS OF FUNCTIONAL DISTURBANCES)

By Heinrich Küchmeister. 411 pages with 152 illustrations. Index. DM. 49.50. Stuttgart, Georg Thieme, 1956.

This book discusses the diagnosis and differential diagnosis of functional disturbances occurring in glands, organs and vessels. The diagnostic methods recommended are based on the common key symptoms observed in clinical and general practice. Complicated diagnostic procedures used by specialists in various fields of medicine and dentistry, are not emphasized because the author assumes that the practitioner will refer the patient to a specialist when he deems it necessary.

An introductory chapter discusses the general criteria which enable the practitioner to arrive at a diagnosis, the procedures necessary for its confirmation, and the value of the differential diagnosis according to specific disease groups. The symptom groups and syndromes are discussed in detail. Each section covering a main symptom has subsections in which the etiologic factors are listed and classified.

The book is substantially bound, printed in clear type on a good quality of paper and is excellently illustrated.

There is a large list of references and a subject index.

This textbook is a valuable addition to the libraries of medical and dental schools and professional societies, and will make interesting reading for practitioners and students able to read German.

Sam G. Warren

TUMOR SURGERY OF THE HEAD AND NECK

By Robert S. Pollack, M.D. 95 pages with 49 illustrations. Index. $5. Philadelphia, Lea & Febiger, 1957.

In the preface for his book, the author says, "Tumor surgery of the head and neck is becoming, more and more, a specialty of its own. . . . As a field of surgery it . . . bridges the gaps between general surgery, otorhinolaryngology, oral surgery and plastic surgery. . . . A book which can help bridge the gap between several specialties and improve the techniques involved, should be of value. It has been with this hope in mind that the present volume was written."

This book is a specialized one and adheres very closely to its subject. The author has used less than 100 pages and his book contains 49 excellent diagrammatic drawings. With this he has set forth in a clear, concise manner the subject which he presents.

Irradiation as a treatment for tumors of the head and neck is dealt with briefly. The book primarily is one in which surgical technics for the eradication of local malignancies are deftly described. There is little discussion of benign tumors.

The author describes the procedures for the examination of the oral cavity for cancer. Here he emphasizes the value of palpation. He says, "One should use the index finger in examining many normal tongues and tonsils, for once acquainted with the feel of the nor-

mal, the feel of the unusual is no problem."

Many topics are dealt with briefly; missed diagnosis, the biopsy, blood replacement, postoperative care, and tracheostomy are some of them.

The author concludes his book by saying, "The success of a cancer operation cannot be judged entirely on the basis of five-year survival. Rather, the success of an operation may depend more on whether there is any local recurrence. All patients who undergo cancer surgery cannot be cured, but without local recurrence they are greatly helped. This fact is apparent with tumor surgery of the head and neck and compels the surgeon to consider carefully each patient before denying him the benefit of a carefully planned and properly performed operation."

Warren R. Schram

WITNESS TO WITCHCRAFT

By Harry B. Wright, D.D.S. 246 pages with 12 illustrations. $3.95. New York, Funk & Wagnalls, 1957.

What is a witch doctor, in terms of our own more or less civilized concepts? Witch doctors comprise both sexes. The fact that almost all are trained in a routine that does not vary much leads one to believe that all have a basic knowledge of human nature. They live by their wits. These practitioners of an ancient art are skilled to a very high degree in some of the technics of mass psychology and psychoanalysis that modern science is only beginning to understand. Their repertoire of technics and abilities is unbelievably varied. They possess powers of a kind which are beyond what we regard as normal. They use drugs and psychological devices with equal facility for curing all sorts of ailments, as well as the prediction of rain. The principal psychological mechanisms which are used in psychotherapy, suggestion and confession, are used widely by witch doctors. They also are advisers, consultants and politicians and are adept at showmanship.

The author, oriented by his own scientific training, and obviously a man of many talents, including skillful photography, traveled and lived among "doctors" and sorcerers, in order to render an eyewitness account of witchcraft in practice. He has searched with experience and imagination for material which others have neglected.

In his travels, Doctor Wright has gone from the headwaters of the Amazon to the jungles of New Guinea, and the villages of the ancient Slave Coast of Africa. He witnessed the strange rites of the "Taro Cult" in Papua, the "Jackal dance" of the Bapende in the Belgian Congo, the weird working of the "Vivala madness" in Dutch New Guinea, and the almost incredible evidence of extrasensory perception and communication among the primitive peoples of these lands. In all these widely separated places, the witch doctor is the "doctor" of the village, greatly feared and respected, and is sometimes evil.

The author packs *Witness to Witchcraft* with many episodes. In an effortless, conversational style he gives a colorful account and guides the reader through his thrilling experiences. The result is an anthology containing much that even specialists in the field have never seen. The book is a well written, exciting narrative sparkling with adventure, and can be recommended highly to anyone interested.

The binding is attractive, the quality of paper good, and the type easily readable.

E. Alan Lieban

REPORT OF THE COMMISSION OF INQUIRY ON THE FLUORIDATION OF PUBLIC WATER SUPPLIES PRESENTED TO THE HOUSE OF REPRESENTATIVES BY COMMAND OF HIS EXCELLENCY

240 pages with illustrations. Index. 8s. Wellington, New Zealand, R. E. Owen, Government Printer, 1957.

Water fluoridation is still being opposed by local groups throughout the United States. Among the reasons for this opposition is the notion that the United States Public Health Service has a vested interest in the adoption of this practice. Most public health authorities are aware of the thoroughness with which the Service conducts its studies and reports its findings. It is, therefore, significant to note that the New Zealand Commission of Inquiry on the Fluoridation of Public Water Supplies (certainly not unduly influenced by American officials) states: . . . "We are satisfied that widespread use should be made of the fluoridation process for the purpose of achieving an urgently needed improvement in the present serious state of dental health."

Among the main headings covered are, Fluoride in Relation to Dental Health, The Behaviour of Fluoride in the Body, Complaints That Fluoride Is Harmful to Health, and Analysis of the Case Against Fluoridation on Medical Grounds.

The report, complete yet concise, gives every indication of a scientific approach. Certainly, it should prove valuable for citation in public discussions.

J. M. Wisan

Current Literature

EXCESSIVE SALIVATION: A CASE REPORT

Woodrow S. Monica. J. Den. Children 24:262 Dec. 1957.

An eight year old boy complained of acute pain in the region of the maxillary left permanent molar. He had salivated profusely for the past four months. He used about 72 handkerchiefs a week to absorb the saliva; he played with a handkerchief in his mouth in order to contain the flow. At night the saliva dampened his pillow. The boy appeared pale, underweight and slovenly. Two pediatricians had ruled out any physical or nervous affliction, and had suggested the boy be seen by a dentist.

The oral examination revealed three abscessed deciduous molars with fistulas, six severely carious deciduous teeth and one carious permanent molar. Three infected molars were extracted, six deciduous teeth were restored, and the maxillary left permanent molar was restored. Shortly thereafter, the saliva became thicker and less profuse. Two weeks later, the excessive salivation subsided. One month later the boy had gained weight.

The excessive salivation was a pathological condition in which the fibers of the autonomic nervous system were stimulated by sharp, carious teeth and infected teeth and gingivae.

PRACTICABILITY OF HARD METAL BURS AND DRILLS (PRAKTISCHE ERGEBNISSE MIT HARTMETALLBOHRERN)

F. Schiller and F. Wlcek. Österr. Zschr. Stomat. 53:412 Aug. 1956.

To preserve vital pulps from potential infection and thermal shock, burs and drills with the highest possible cutting efficiency should be used.

Hard metal burs and drills, especially those made of tungsten carbide, are recommended. These instruments usually consist of two parts: heads that are made of cemented tungsten carbide, and necks and shanks that are made of stainless steel. Tungsten carbide burs and drills are superior in hardness and cutting efficiency to all commonly used chrome or nonchrome steel burs or drills.

At the Dental Clinic of the Austrian Public Health Authorities in Vienna, 30 tungsten carbide burs, manufactured by different dental supply companies in England, Germany and Austria, were tested. These instruments were used to prepare 1,045 mesial, 392 mesioocclusal and 968 mesioocclusodistal cavities.

For the preparation of comparatively small cavities, 50 fine cut tapered burs were used.

It was calculated that each tungsten carbide bur is capable of cutting about 200 mesial cavity preparations regardless of type and origin of the instrument.

After an extremely high cutting efficiency exhibited in the first 30 cavity preparations, the cutting quality decreases slowly because of minor chips in the cutting blades.

If the dentist discards each tungsten carbide bur after 30 cavity preparations because of the decrease in cutting efficiency, he will obtain the best possible result; one that cannot be equaled by the use of chrome or nonchrome stainless steel burs.

If, however, he uses these burs for about 170 additional cavity preparations, in spite of minor defects in the cutting blades, the cutting efficiency of these instruments will be somewhat decreased but a significant saving in money is achieved without impairing the quality of his work to any great extent.

THE ORAL VEILLONELLA IN RELATION TO DENTAL CARIES

W. Sims and Marshall L. Snyder. Brit. D.J. 104:123 Feb. 18, 1958.

Counts of over 150 million anaerobic gramnegative cocci per milliliter of saliva in the human mouth have been reported. In 1950 Douglas suggested that since large numbers of veillonella could rapidly metabolize any lactic acid being formed in the mouth, they might constitute a considerable deterrent to the progress of dental caries.

Sixty children ranging in age from 7 to 18 years, having the highest caries activity, were selected from the caries-active children attending the Washington State School for the Deaf, Vancouver. Sixty children ranging in age from 11 to 18 years, having a low caries activity, were selected from a group of Navajo Indian children attending the Chemawa Indian School, Salem, Ore.

Wax-stimulated saliva specimens were obtained from both groups of children, and veillonella counts were performed within eight hours of collection and lactobacillus counts within 24 hours. During the period of study the 60 Washington children developed eight

new DMF surfaces for every one new DMF surface which occurred in the Indian children. The mean lactobacillus count for the Washington children was 432,800 and the caries incidence (DMF surfaces) was 4.9. The mean lactobacillus count for the Indian children was 1,900 and the mean caries incidence (DMF surfaces) was 0.6.

Although the veillonella counts were somewhat higher for the Washington children, the difference was not statistically significant at the 5 per cent level.

It must be concluded that veillonella are equally prevalent in the mouths of both caries-active and caries-inactive individuals. Although veillonella probably enhance resistance to dental caries by virtue of their significant contribution to the buffering capacity of the dental plaque, the protection they afford must be of a limited nature and enjoyed by caries-active and caries-inactive individuals alike. The reason that veillonella are of only limited value in preventing dental caries is almost certainly because they are unable to grow in an environment of pH 5.5 or lower. When an acidity of this order develops in a dental plaque, lactic acid will be able to accumulate more readily because it is no longer being metabolized by the veillonella.

UNUSUAL LUXATION OF MANDIBULAR CONDYLE: REPORT OF CASE

Estell E. Morris and Charles E. Hutton. J. Oral Surg. 15:332 Oct. 1957.

A 16 year old boy was admitted to the hospital with multiple injuries sustained in an automobile accident. He was unable to close his mouth. Roentgenograms revealed an anterior luxation of the left mandibular condyle and a midline fracture of the mandible with the left side considerably displaced downward.

When the boy's general condition had improved sufficiently, he was taken to surgery and, under general anesthesia, several attempts were made to relocate the displaced condyle. All attempts failed.

Five days later another attempt was made to relocate the mandibular condyle. When this effort was unsuccessful, a condylectomy was planned.

Exposure of the left condyle revealed that it had been forced out of the glenoid fossa and was superior and medial to the zygomatic arch. The condyle could not be forced down between the temporal bone and the zygomatic arch.

Access to the condyle was gained by removal of a section of the zygomatic arch. The neck of the condyloid process was sectioned and the condyle removed. The zygomatic arch was replaced and fixed with transosseous wires. The fractured mandible could then be reduced and stabilized with arch bars and rubber ligatures. The postoperative course was uneventful except that the patient refused to exercise the mandible properly after the appliance had been removed.

About one year later the patient was admitted to the hospital with fibrosis of the left temporomandibular region. He could open his mouth only 0.5 cm. Under general anesthesia the mandible was forced open. Strict exercises followed.

Two weeks later, on discharge, the patient could open his mouth 3.4 cm.

THE BACTERIAL FLORA OF ROOT CANALS AS DISCLOSED BY A CULTURE MEDIUM FOR ENDODONTICS

Joseph M. Leavitt, Irving J. Naidorf and Pauline Shugaevsky. Oral Surg., Oral Med. & Oral Path. 11:302 March 1958.

Although culture taking has become part of the accepted routine in the endodontic technic of an increasing number of practitioners, it has not offered a complete solution to the problem of determining sterility of the root canal. The mediums used by most endodontists are only partially effective in disclosing the prescence of aerobes and virtually ineffective in disclosing the presence of anaerobes.

Several years ago the authors instituted a research program in an attempt to find a culture medium, suitable for clinical use, which would demonstrate the presence of all the organisms which might be found in the endodontist's field of operation in the infected pulp canal. Of the mediums tested, the most promising was trypticase soy broth with 0.1 per cent agar (TSA) added. A program was instituted to test the effectiveness of TSA in clinical use.

TSA was clinically tested for two years and found to be sensitive to anerobic as well as aerobic growth.

The bacterial flora of infected root canals, as disclosed by TSA, presented a much wider and different variety of organisms than disclosed by dextrose broth, a culture medium commonly used in endodontics.

TSA discloses anaerobes in percentages comparable to those shown by strict anaerobic laboratory technics (about 33 per cent), and at the same time TSA is particularly sensitive for most aerobic growth.

Deaths

Altfillisch, Henry J., Dubuque, Iowa; University of Iowa College of Dentistry, 1909; died December 10; age 71.

Amundson, Frederick A., Duluth, Minn.; University of Minnesota School of Dentistry, 1906; died January 26; age 76.

Anbinder, Tulea H., Brooklyn; New York University College of Dentistry, 1935; died February 3; age 52.

Anderson, John S., Philadelphia; Pennsylvania College of Dental Surgery, 1894; died February 28; age 89.

Anshutz, Frank P., Terre Haute, Ind.; Ohio College of Dental Surgery, University of Cincinnati, 1895; died February 7; age 84.

Archer, George S., New York; died February 20; age 76.

Archer, Joseph B., Hartsville, Tenn.; University of Tennessee College of Dentistry, 1911; died February 2; age 73.

Arnold, Forest L., Winter Garden, Fla.; Louisville College of Dentistry, 1917; died March 3; age 61.

Aronson, George G., Mount Vernon, N. Y.; Dental Institute University of Berlin, Germany, 1891; died November 3; age 88.

Barr, Charles W., Portland; died February 16; age 92.

Barton, Charles K., Erie, Pa.; Temple University School of Dentistry, 1915; died February 4; age 70.

Benedict, Leroy C., Mansfield, Ohio; Ohio Medical University College of Dentistry, 1900; died February 22; age 78.

Bennett, Edward S., Nantucket, Mass.; Tufts College Dental School, 1902; died August 24; age 86.

Binder, Samuel L., West New York, N. J.; New York College of Dentistry, 1923; died February 15; age 58.

Birkbeck, Thomas J., Lebanon, Pa.; Philadelphia Dental College, 1901; died November 12; age 80.

Bishop, John L., Plainville, Conn.; Howard Dental School, Boston, 1935; died February 26; age 49.

Bohrer, John D., Green City, Mo.; Northwestern University Dental School, 1904; died January 18; age 84.

Bond, John H., Fairbury, Neb.; University of Illinois College of Dentistry, 1903; died February 18; age 80.

Bonnoitt, Lawrence W., Columbia, S. C.; Baltimore College of Dental Surgery, 1911; died December 14; age 65.

Booher, Wallace J., Missouri Valley, Iowa; University of Iowa College of Dentistry, 1910; died February 2; age 69.

Bost, David E., Galesburg, Ill.; St. Louis University School of Dentistry, 1924; died January 1; age 58.

Boutin, Ralph G., Cape Girardeau, Mo.; Western Dental College, 1906; died February 13; age 77.

Breihan, Gerhard H., Rock Springs, Wyo.; Kansas City Dental College, 1911; died December 30; age 72.

Britowich, Arthur A., Baltimore; Baltimore College of Dental Surgery, 1933; died February 9; age 48.

Bronstein, Benjamin J., Chicago; University of Illinois College of Dentistry, 1906; died January 5; age 80.

Bronstein, Edward L., Hewlett, L. I., N. Y.; New York College of Dentistry, 1913; died January 22; age 66.

Brown, Hampton E., Centerville, Md.; Baltimore College of Dental Surgery, 1901; died January 14, 1957; age 80.

Burke, William T., Dallas, Texas; Howard University College of Dentistry, 1923; died February 18; age 61.

Bush, James E., Jacksonville, Fla.; Howard University College of Dentistry, 1915; died January 4; age 70.

Bushong, William D., Brooklyn; New York University College of Dentistry, 1924; died March 17; age 63.

Butler, Charles E., San Antonio, Texas; Vanderbilt University School of Dentistry, 1919; died March 6; age 67.

Christopherson, Henry O., Amboy, Minn.; Northwestern University Dental School, 1913; died February 24; age 74.

Church, Hugh L., Martinsburg, W. Va.; University of Pittsburgh School of Dentistry, 1927; died January 22; age 54.

Clark, Earl L., Duarte, Calif.; University of Southern California School of Dentistry, 1910; died February 8; age 69.

Clark, Herman T., Orlando, Fla.; Kansas City-Western Dental College, 1925; died January 4; age 62.

Cobey, Howard P., Washington, D. C.; National University Dental Department, Washington, D. C.; 1897; died March 8; age 82.

Cohler, Michael J., St. Paul; University of Minnesota School of Dentistry, 1917; died January 2; age 61.

Cole, John E., Aurora, Ind.; Cincinnati College of Dental Surgery, 1901; died December 6; age 85.

Cole, Lynn R., Altadena, Calif.; University of Pennsylvania School of Dentistry, 1910; died January 6; age 72.

Colum, Hezekiah S., Chicago; Howard University College of Dentistry, 1923; died January 1; age 64.

Connell, Osa O., Notasulga, Ala.; Birmingham Dental College, 1909; died March 12; age 76.

Conrad, Herbert W., Hackensack, N. J.; University of Maryland Dental Department, 1908; died February 2; age 85.

Cooper, E. B., Fairfield, Ala.; Atlanta-Southern Dental College, 1931; died February 7; age 52.

Cory, Edwin F., North Haven, Conn.; University of Pennsylvania School of Dentistry, 1902; died February 17; age 80.

Crane, William E., Norfolk, Neb.; Creighton University College of Dentistry, 1908; died March 1; age 77.

Culbert, Jay Emmett, Reno, Nev.; University of Denver School of Dentistry, 1927; died March 6; age 56.

Currie, Charles W., Chico, Calif.; Chicago College of Dental Surgery, 1909; died February 12; age 74.

Darlington, Norman S., West Chester, Pa.; University of Pennsylvania School of Dentistry, 1915; died January 10; age 72.

De Sola, Solomon, New York; University of Pennsylvania School of Dentistry, 1900; died February 28; age 83.

Domeniconi, Henry P., San Francisco; College of Physicians and Surgeons, 1926; died February 22; age 59.

Dowd, Michael J., Grand Island, Neb.; Creighton University College of Dentistry, 1909; died February 9; age 75.

Downey, Edwin F., Greenfield, Ind.; Indiana University School of Dentistry, 1944; died February 26; age 42.

Drake, Leonard S., Chicago; Northwestern University Dental School, 1897; died December 1; age 89.

Drelich, Robert C., Jersey City, N. J.; University of Pennsylvania School of Dentistry, 1942; died March 5; age 41.

Drues, Lionel N., Chicago Heights, Ill.; University of Illinois College of Dentistry, 1920; died February 17; age 63.

Duguid, Ralph O., Joliet, Ill.; Chicago College of Dental Surgery, 1906; died December 26; age 76.

Duke, Warren C., Camden, Ala.; Atlanta Dental College, 1907; died November 14; age 78.

Eck, Edward J., Belfield, N. D.; Chicago College of Dental Surgery, 1920; died February 14, 1957; age 70.

Eckstein, Gustav, Cincinnati; Ohio College of Dental Surgery, University of Cincinnati, 1904; died February 18; age 92.

Emerson, Herbert E., West Hartford, Conn.; Harvard Dental School, 1930; died January 22; age 54.

Engel, Don F., Ludington, Mich.; University of Michigan School of Dentistry, 1938; died January 29; age 42.

Esposito, Michael A., Rome, N. Y.; University of Pennsylvania School of Dentistry, 1931; died February 10; age 53.

Evans, Daniel A., Ashley, Pa.; University of Maryland Dental Department, 1901; died February 9; age 79.

Farrell, Roscoe M., Pittsboro, N. C.; Baltimore College of Dental Surgery, 1913; died December 25; age 67.

Feinstein, Charles, Jacksonville, Fla.; Columbia University School of Dental and Oral Surgery, 1927; died January 16; age 52.

Fernald, Adelbert, Newton, Mass.; Harvard Dental School, 1896; died February 25; age 85.

Fintel, Berta, New York; New York University College of Dentistry, 1954; died December 3; age 33.

Fleming, Eugene G., Bradford, Pa.; University of Pittsburgh School of Dentistry, 1925; died March 6; age 68.

Forsyth, Arthur H., Pe Ell, Wash.; University of Michigan School of Dentistry, 1910; died February 5; age 69.

Gill, William H., Lander, Wyo.; Northwestern University Dental School, 1908; died March 3; age 79.

Godwin, F. Whitney, Suffolk, Va.; Baltimore College of Dental Surgery, 1921; died February 21; age 62.

Gorgas, Herbert F., Baltimore; Baltimore College of Dental Surgery, 1891; died February 12; age 87.

Graf, William E., New York; New York College of Dentistry, 1916; died February 20; age 62.

Graves, Harvey J., Jefferson City, Mo.; died February 24; age 62.

Greene, Howard C., De Land, Fla.; Baltimore College of Dental Surgery, 1911; died December 8, age 69.

Grier, Walter L., Milford, Del.; Pennsylvania College of Dental Surgery, 1900; died January 30.

Grubman, Joseph, Woodmere, N. Y.; New York College of Dentistry, 1917; died February 6; age 61.

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THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

222 East Superior Street, Chicago 11, Illinois

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All expressions of opinion and statements of supposed fact are published on the authority of the writer over whose signature they appear and are not to be regarded as expressing the views of the American Dental Association, unless such statements or opinions have been adopted by the Association. Articles are accepted with the understanding that they have not been published previously and that they are submitted solely to The Journal. The Journal of the American Dental Association is indexed in the Index to Dental Literature, in the Current List of Medical Literature and, in part, in the Quarterly Cumulative Index Medicus, Biological Abstracts and Chemical Abstracts.

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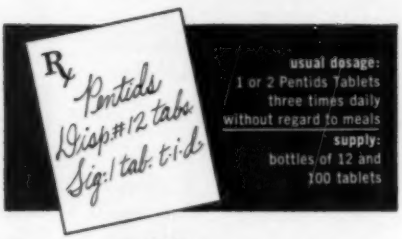

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Announcements

MEETINGS OF THE AMERICAN DENTAL ASSOCIATION

Ninety-Ninth Annual Session	Nov. 10-13, 1958	Dallas, Texas
One-Hundredth Annual Session	Sept. 14-18, 1959	New York
One-Hundred and First Annual Session	Oct. 17-20, 1960	Los Angeles
One-Hundred and Second Annual Session	Oct. 16-19, 1961	Philadelphia

MEETINGS OF CONSTITUENT SOCIETIES

State	Date	Place	Secretary	Address
Alabama	Apr. 19-22, 1959	Birmingham	C. R. Crook	Professional Center, Montgomery
Alaska			C. L. Polley	Box 1896, Juneau
Arizona			W. G. Burke	15 E. Monroe St., Phoenix
Arkansas	Apr. 12-15, 1959	Little Rock	D. M. Hamm	Box 89, Clarksville
California	Apr. 20-22, 1959	San Francisco	W. J. Healy	450 Sutter St., San Francisco 8
S. California	May 4-6, 1959	Los Angeles	S. M. Silverman	903 Crenshaw Blvd., Los Angeles 19
Colorado	Oct. 5-8	Colorado Springs	G. H. Jackson	724 Republic Bldg., Denver
Connecticut	May 13, 14, 1959	Hartford	E. S. Arnold	37 Linnard Rd., W. Hartford
Delaware			A. G. Schiek	3716 Philadelphia Pike, Claymont
District of Columbia	Mar. 15-18, 1959	Washington	J. F. Keaveny	1029 Vermont Ave., N.W., Washington
Florida	May 17-20, 1959	Hollywood	G. J. Perdigon	17 Davis Blvd., Tampa
Georgia	Oct. 12-15	Atlanta	F. M. Butler, Jr.	Bankers Insurance Bldg., Macon
Hawaii			J. H. Dawe	810 N. Vineyard St., Honolulu
Idaho			G. L. Williamson	100 3½ Main St., Boise
Illinois	May 11-13, 1959	Peoria	P. W. Clopper	632 Jefferson Bldg., Peoria
Indiana	May 18-20, 1959	Indianapolis	W. R. Shoemaker	Citizens Bank Bldg., Anderson
Iowa	May 3-6, 1959		H. I. Wilson	Insurance Exchange Bldg., Des Moines
Kansas	Apr. 26-29, 1959	Topeka	F. A. Richmond	Brotherhood Bldg., Kansas City 1
Kentucky	Apr. 5-8, 1959	Louisville	A. B. Coxwell, Jr.	2208 Dundee Rd., Louisville 5
Louisiana	Apr. 1-4, 1959	Shreveport	J. S. Bernhard	2515 Line Ave., Shreveport
Maine			S. M. Gower	Box 27, Skowhegan
Maryland	May 3-6, 1959	Baltimore	C. L. Inman, Jr.	Medical Arts Bldg., Baltimore
Massachusetts	May 3-6, 1959	Boston	H. E. Tingley	12 Bay State Rd., Boston 15
Michigan	Apr. 20-22, 1959	Grand Rapids	F. Wertheimer	Michigan Dept. of Health, Lansing
Minnesota	Apr. 13-15, 1959	Minneapolis	C. V. E. Cassel	2236 Marshall Ave., St. Paul 4
Mississippi			B. A. Cohen	500-E E. Woodrow Wilson Dr., Jackson 27
Missouri	May 10-13, 1959	Springfield	E. D. Suggett	Merchants Bank Bldg., Jefferson City
Montana	May 7-9, 1959	Kalispell	R. C. Ritter	28 N. Black St., Bozeman
Nebraska	Apr. 26-29, 1959	Lincoln	F. A. Pierson	Federal Securities Bldg., Lincoln
Nevada			O. M. Seifert	755 Ryland Ave., Reno
New Hampshire			F. E. Williams	814 Elm St., Manchester
New Jersey	May 12-15, 1959	Atlantic City	J. G. Carr	407 Cooper St., Camden
New Mexico	May 1959	Santa Fe	J. S. Ellar	7 Medical Arts Sq., N.E., Albuquerque
New York	May 10-13, 1959	Syracuse	C. A. Wilkie	1 Hanson Pl., Brooklyn 17
North Carolina	May 3-6, 1959	Pinehurst	L. H. Butler	Jefferson Bldg., Greensboro

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State	Date	Place	Secretary	Address
North Dakota	May 3-6, 1959	Grand Forks	J. H. Pfister	419½ Dakota Ave., Wahpeton
Ohio	Sept. 28-Oct. 1	Cincinnati	E. G. Jones	185 E. State St., Columbus
Oklahoma	Apr. 26-29, 1959	Tulsa	L. D. Wright	Osler Bldg., Oklahoma City
Oregon	Mar. 2-4, 1959	Portland	T. D. Holder	Selling Bldg., Portland
Panama Canal Zone			W. R. Bond, Jr.	U.S.A., Ft. Kobbe Denta Clinic, Ft. Kobbe
Pennsylvania	May 13-16, 1959	Harrisburg	M. D. Zimmerman	217 State St., Harrisburg
Puerto Rico	Jan. 1959	San Juan	J. E. Munoz	157 De Diego St., Rio Piedras
Rhode Island	Jan. 20, 21, 1959	Providence	H. A. McGuirl	Union Trust Bldg., Providence
South Carolina	May 24-26, 1959	Charleston	J. E. Wallace	1506 Gregg St., Columbia
South Dakota	May 31-June 2, 1959	Rapid City	R. E. Decker	Box 308, Parker
Tennessee	May 11-14, 1959	Nashville	K. P. Ezell	116 N. Academy, Murfreesboro
Texas	May 3-6, 1959	San Antonio	C. A. McMurray	Alexander Bldg., Ennis
Utah			R. C. Dalgleish	State Capitol Bldg., Salt Lake City
Vermont			E. H. Van Santvoord	22 Washington St., Rutland
Virginia			W. T. McAfee	Colonial National Bank Bldg., Roanoke
Washington	April 6-8, 1959	Seattle	G. D. Dore, Jr.	211 Medical Dental Bldg., Seattle 1
West Virginia	July 20-23	White Sulphur Springs	G. N. Casto, Jr.	710½ Lee St., Charleston
Wisconsin	Apr. 27-29, 1959	Milwaukee	C. J. Baumann, Jr.	606 W. Wisconsin Ave., Milwaukee
Wyoming			T. J. Drew	State Office Bldg., Cheyenne

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

State	Date	Place	Secretary	Address
Alabama			W. L. McCarty	Professional Center, Montgomery
Alaska			R. H. Williams	Box 2122, Juneau
Arizona			W. G. Biddulph	1502 W. Osborn Rd., Phoenix
Arkansas			W. T. Jones	107 E. Shelton, Monticello
California			D. R. Grant	507 Polk St., San Francisco
Colorado			R. F. Gilmore	Republic Bldg., Denver 2
Connecticut			C. G. Brooks	302 State St., New London
Delaware			P. K. Musselman	143 W. Main St., Newark
District of Columbia			W. T. Birthright	1855 Eye St., N.W., Washington
Florida			R. P. Taylor, Jr.	P. O. Box 2913, Jacksonville 3
Georgia			W. G. Brown	Blackshear
Hawaii	Aug. 28-Sept. 1‡		J. Y. Ing	James Campbell Bldg., Honolulu
Idaho			A. G. DeWinter	Sun Bldg., Boise
Illinois			W. A. McKee	Wood Bldg., Benton
Indiana			C. A. Frech	Gary National Bank Bldg., Gary
Iowa			P. A. Hahn	Farmers & Merchants Bank Bldg., Burlington
Kansas			G. L. Teall	Box 71, Hiawatha
Kentucky			J. J. Kelly	102 W. Madison St., Franklin
Louisiana			R. C. Steib	Maison Blanche Bldg., New Orleans
Maine			A. S. Appleby	Box 260, Skowhegan
Maryland			W. D. Burton	829 Park Ave., Baltimore 1
Massachusetts			C. R. Williams	70 Washington St., Salem
Michigan			J. L. Champagne	3714 W. McNichols Rd., Detroit 21
Minnesota			E. A. Nelson	2236 Marshall Ave., St. Paul 4 W
Mississippi			A. H. Richter, Jr.	Aven Bldg., Greenwood
Missouri			R. R. Rhoades	Central Trust Bldg., Jefferson City
Montana			R. O. Betzner	303 Power Block, Helena
Nebraska			H. E. Weber	Stuart Bldg., Lincoln
Nevada	Dec. 7	Reno	R. Whitehead	40 W. First St., Reno

AMERICAN DENTAL ASSOCIATION

99TH ANNUAL SESSION *Dallas, Texas*

NOVEMBER 10-13, 1958

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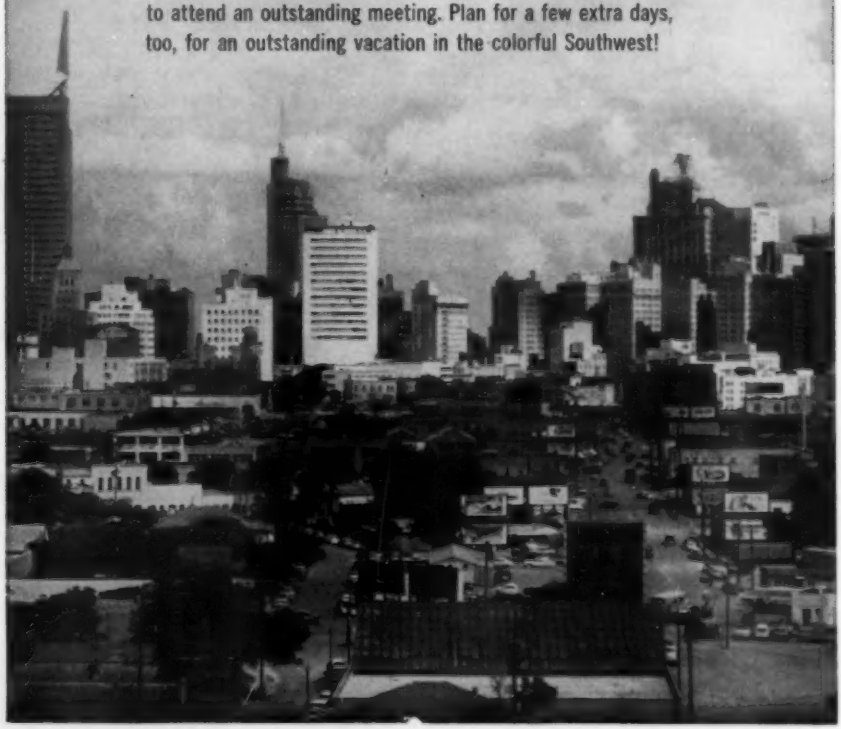

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New Hampshire			S. G. Markos	8 Renaud Ave., Dover
New Jersey			C. J. Schweikhardt	150 E. State St., Trenton 8
New Mexico			J. J. Clarke, Sr.	Artesia
New York	Dec. 2-5, 8, 9*‡		D. W. Beier	23 S. Pearl St., Albany 7
North Carolina			J. H. Guion	Doctors Bldg., Charlotte 7
North Dakota			G. F. Wirtz	Clinic Bldg., Mandan
Ohio			D. E. Bowers	322 E. State St., Columbus 15
Oklahoma			W. H. Stephens	Plaza Court Bldg., Oklahoma City
Oregon			F. L. Utter	Pioneer Trust Bldg., Salem
Pennsylvania			R. E. V. Miller, Sr.	Dept. of Public Instruction, Box 911, Harrisburg
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Tennessee			C. R. Aita	Bennie-Dillon Bldg., Nashville
Texas			R. T. Weber	Capital National Bank Bldg., Austin 16
Utah			M. T. Rigby	47 E. Center St., Midvale
Vermont			P. M. Fitch	Newport
Virginia			J. M. Hughes	Medical Arts Bldg., Richmond
Washington			F. S. Rotchford	1108 S. Washington St., Olympia
West Virginia			C. C. Cottrill	Box 111, Glen Rogers
Wisconsin			S. F. Donovan	Tomah
Wyoming			E. E. Edwards	Bank of Commerce Bldg., Sheridan

Most states require applications to be in 30 days prior to examination date.
*Dental examination. †Dental hygiene examination. ‡Write to secretary of dental examining board for information on locations of examinations.

MEETINGS OF OTHER ORGANIZATIONS

Name	Date	Place	Secy. or Chm.	Address
American Academy of Gold Foil Operators	Nov. 7, 8	Dallas	C. C. Latham Secy.	1125 Tenth St., Coronado, Calif.
American Academy of the History of Dentistry	Nov. 7	Dallas	M. B. Asbell Secy.	25 Haddon Ave., Camden, N.J.
American Academy of Implant Dentures	Nov. 7-9	Dallas	A. N. Cranin Secy.	2120 Ocean Ave., Brooklyn 29
American Academy of Oral Roentgenology	Nov. 7, 8	Dallas	T. S. Grant Secy.	508 16th St., Oakland, Calif.
American Academy of Pedodontics	Aug. 28-30	St. Louis	W. E. Cody Secy.	1325 E. 16th Ave., Denver
American Academy of Periodontology	Nov. 6-8	Dallas	C. E. Chamberlain Secy.	1101 N. North St., Peoria, Ill.
American Association of Dental Editors	Nov. 9	Dallas	A. H. Kutscher Secy.	400 N. 8th Ave., Highland Park, N.J.
American Association of Dental Examiners	Nov. 7, 8	Dallas	G. L. Teall Secy.	Box 71, Hiawatha, Kan.
American Association of Dental Schools	Nov. 9	Dallas	M. W. McCrea Secy.	School of Dentistry, University of Minnesota, 127 Owre Hall, Minneapolis
American Association of Public Health Dentists	Nov. 8	Dallas	P. Ayres Secy.	Box 2591, Jefferson County Dept. of Health, Birmingham, Ala.
American Board of Dental Public Health	Nov. 6, 7	Dallas	C. V. Tossy Secy.	Michigan Dept. of Health, Lansing, Mich.
American Board of Oral Pathology	Dec. 6, 7		D. A. Kerr Secy.	University of Michigan, School of Dentistry, Ann Arbor, Mich.
American Board of Oral Surgery	Aug. 2 Dec. 1 Apr. 2-6, 1959	Chicago Chicago	L. M. FitzGerald Secy.	Roshek Bldg., Dubuque, Iowa
American Board of Pedodontics	July 29-31	Indianapolis	R. L. Ireland Secy.	College of Dentistry, University of Nebraska, Lincoln 8, Neb.
American College of Dentists	Nov. 9	Dallas	O. W. Brandhorst Secy.	4221 Lindell Blvd., St. Louis

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FIG. A FIG. B FIG. C

The function of gingival bevels

Fig. A shows a flat gingival seat which presents short, unsupported enamel rods which may fall away after the impression is taken or during seating of the inlay.

Fig. B indicates use of a reverse bevel which contributes to the resistance form and helps to guide the inlay to a positive seat during cementation.

Fig. C, the more usual method, shows a bevel of the gingival seat. This prevents the leaving of any loose ends of enamel rods which may fall away while seating the restoration or after the restoration is in service. Here, no free ends of enamel rods are presented along the gingival margin.

(Prepared under the direction of competent dental authority.)

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American Dental Assistants Association	Nov. 10-13	Dallas	M. L. Martin Exec. Secy.	First National Bank Bldg., La Porte, Ind.
American Dental Assistants Certification Board	Oct. 8		F. Smith	23 W. 33 St., Bayonne, N.J.
American Dental Hygienists' Association	Nov. 10-13	Dallas	M. E. Swanson Exec. Secy.	100 E. Ohio St., Chicago
American Dental Society of Anesthesiology	Nov. 8, 9	Dallas	H. A. Sultz Secy.	249 Linwood Ave., Buffalo
American Dental Society of Europe	July 2-5	Knokke, Belgium	J. P. Molony Secy.	110 Harley St., London W.1, England
American Denture Society	Nov. 7, 8	Dallas	V. L. Steffel Secy.	College of Dentistry, Ohio State University, Columbus, Ohio
American Institute of Dental Medicine	Oct. 12-16	Palm Springs, Calif.	M. Lewis Exec. Secy.	2240 Channing Way, Berkeley 4, Calif.
American Society for the Advancement of General Anesthesia in Dentistry	Oct. 27	New York	M. H. Feldman Exec. Secy.	730 Fifth Ave., New York 19
American Society of Dentistry for Children	Nov. 7-9	Dallas	R. E. McDonald Secy.	School of Dentistry, Indiana University, 1121 W. Michigan St., Indianapolis
American Society of Oral Surgeons	July 30-Aug. 2	Chicago	A. B. Coxwell Exec. Secy.	2208 Dundee Rd., Louisville 5, Ky.
Ark-La-Tex Dental Congress	Aug. 18	Shreveport, La.	J. Wyrick Secy.	Texarkana National Bank Texarkana, Texas
Arpa Internationale, Twenty-fifth Congress	July 7-12	Paris, France	A. J. Held Pres.	Institute Universitaire de Medecine Dentaire, 24 rue Micheli-du-Crest, Geneva, Switzerland
Association of American Women Dentists	Nov. 10	Dallas	M. B. McCann Secy.	2600 N. McCullough, San Antonio, Texas
Austrian Dental Association	Sept. 18-21	Salzberg, Austria	K. Czerwenka	Franz Josef Strasse 12, Salzburg, Austria
British Dental Association	July 7-12	Dundee, Scotland	H. P. Buchanan Secy.	13 Hill St., Berkeley Square, London W. 1, England
Canadian Dental Association	Oct. 26-29	Montreal	D. W. Gullett Secy.	234 St. George St., Toronto 5, Canada
Chicago Dental Society	Feb. 8-11, 1959	Chicago	K. S. Richardson Exec. Secy.	30 N. Michigan Ave., Chicago
Congress of Stomatologists of Yugoslavia (Second)	Sept. 18-20	Beograd, Yugoslavia	P. Stosic Secy.	Stomatoloski fakultet, Beograd, Rankeova 4, Yugoslavia
Council on Dental Education, Dental Aptitude Tests	Oct. 3, 4		S. Peterson Secy.	222 E. Superior St., Chicago 11
Cuban National Dental Congress (Fifth)	Nov. 14-17	Havana	C. Funcia C.	No. 353, Vedado, Havana, Cuba
Denver Dental Association	Jan. 11-14, 1959	Denver	W. D. McCarthy Secy.	Republic Bldg., Denver 2
Detroit District Dental Society	Nov. 24, 25	Detroit	S. Silverman Chm.	6426 Van Dyke Ave., Detroit 13
European Orthodontic Society	July 4-8	Copenhagen, Denmark	A. Bjork	Royal Dental College, 4, Universitetsparken, Copenhagen, Denmark
Federation Dentaire Internationale, 46th Annual Meeting	Aug. 27-Sept. 3	Brussels, Belgium	G. H. Leatherman Secy.	35 Devonshire Pl., London W.1, England
Greater New York Dental Meeting (Thirty-fourth)	Dec. 8-12	New York	M. Purdy Exec. Secy.	Statler Hotel, New York 1
International College of Dentists	Nov. 9	Dallas	H. O. Westerdahl Secy.	4829 Minnetonka Blvd., Minneapolis
International Dental Meeting of Paris (Thirty-second)	Nov. 24-30	Paris, France	R. A. Robert Gen. Secy.	10, rue de l'Isly, Paris 8, France
Italian Society of Dentistry and Maxillofacial Surgery	Sept. 3-7	Pavia, Italy	S. Palazzi Dir.	Clinica Odontoiatrica, Universita di Pavia, Pavia, Italy
Mid-Continent Dental Congress	Oct. 12-15	St. Louis	J. E. Brophy Exec. Secy.	8013 Maryland Ave., Clayton 5, Mo.
Mississippi Conference on Periodontia and Dental Medicine	Aug. 13, 14	University, Miss.	D. C. Trexler Dir.	Dept. Conferences, Institutes, and Short Courses, University of Mississippi, University Extension, University, Miss.

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Name	Date	Place	Secy. or Chm.	Address
National Association of Seventh Day Adventist Dentists	Nov. 7-9	Dallas	G. H. Curtis Secy.	Medical College of Evangelists, Dental School, Loma Linda, Calif.
National Board of Dental Examiners	Dec. 1, 2		G. J. Casey Secy.	222 E. Superior St., Chicago 11
National Dental Association, Inc.	Aug. 3-7	Pittsburgh	E. N. Jackson Secy.	P. O. Box 197, Charlottesville, Va.
New England Dental Society	Oct. 21, 22	Boston	W. F. O'Meara Secy.	904 Main St., Hartford, Conn.
New Orleans Dental Conference (Eleventh)	Nov. 23-26	New Orleans	A. A. Copping Secy.	4704 Paris Ave., New Orleans
Northeastern Society of Orthodontists	Nov. 3, 4	Montreal, Canada	D. Mossberg Secy.	36 Central Park S., New York
Northern Brazil First Congress	July 7-12	Macapa	J. M. Lima Gen. Secy.	Central Committee on Organization, First Congresso Nortista de Odontologia, Macapa, Amapa, Brazil
Odontological Federation of Central America and Panama, Second International Convention	Nov. 26-29	San Jose, Costa Rica	R. Chartier Chm.	P.O. Box 698, San Jose, Costa Rica, C.A.
Odontological Society of Western Pennsylvania	Sept. 30-Oct. 2	Pittsburgh	H. D. Butts, Jr. Secy.	Jenkins Bldg., Pittsburgh 22
Pan-American Dental Congress	Nov. 18-22	Mexico City, Mexico	R. E. Woodworth For. Secy.	Asociacion Dental Mexicana Sinaloa 9, Mexico 7, D. F., Mexico
Pan American Odontological Association	Dec. 10	New York	R. H. Brodsky Exec. Secy.	14 E. 81st St., New York
Rumanian Stomatological Congress	Dec.		N. Herman Secy.	Section de Somatologie de la Societe des Sciences Medicales de la Republique Populaire Roumaine, Str. Progresului 8, Bucharest, Rumania
Sao Paulo, Brazil, International Dental Meeting	Sept. 14-20	Sao Paulo, Brazil	J. Hildebrando T. Secy.	126 Avenida Sao Joao, Sao Paulo, Brazil

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ILLINOIS—1956 graduate, licensed, desires association with ethical, established practitioner in Chicago or suburbs. Completing service obligation August 1958. Address A.D.A. Box No. 126.

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INDIANA—Licensed 1956 graduate completing military obligation July 1958 desires association with established general practitioner or group practice. Two years' experience all phases dentistry at isolated military dental clinic. Address A.D.A. Box No. 990.

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MARYLAND—Licensed, young graduate, military service completed, desires general practice association, employment or other opportunity. Washington area preferred but not essential. Address A.D.A. Box No. 136.

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New York, New Jersey practice wanted. Cash to invest. Must be lucrative; two or more operating rooms. May consider association. Contact H. Nathanson, 175 Smith St., Perth Amboy, N. J.

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Position or association wanted. New Jersey licensed dentist in North Jersey area. Have had surgical internship, 20 years' experience in all branches of dentistry. Conscientious and reliable. References. Address A.D.A. Box No. 138.

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NEW YORK—1956 Columbia graduate, New York license, 28, desires association in New York or suburban area in general practice. Military obligation will be completed in August. Address A.D.A. Box No. 139.

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Ohio licensed dentist, married, 27, desires location in central or northern Ohio. Military obligation completed in July. Interested in association leading to purchase of active practice. Address A.D.A. Box No. 140.

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OREGON—Licensed dentist, age 26, married, presently completing military requirements. Desire association in or around Portland area with general practitioner. Available August 1. Welcome interview. Address A.D.A. Box No. 994.

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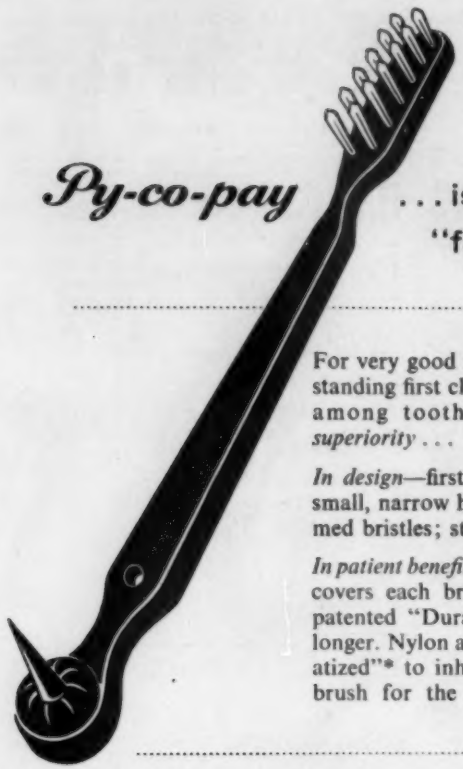

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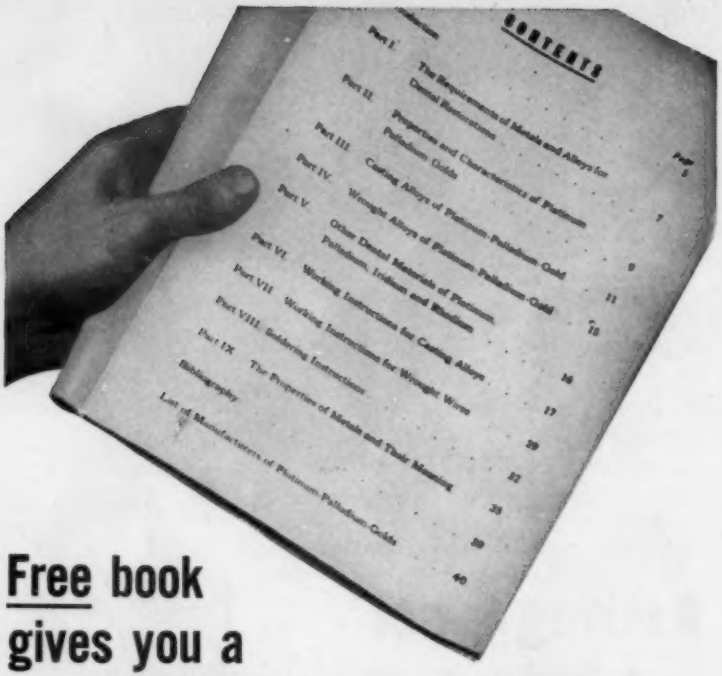
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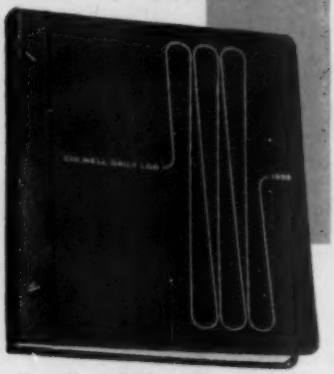

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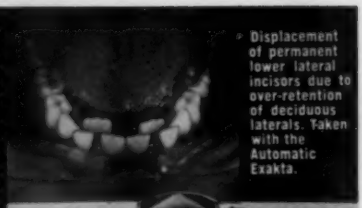
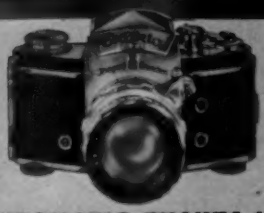


• Displacement of permanent lower lateral incisors due to over-retention of deciduous laterals. Taken with the Automatic Exakta.



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Postextraction Facial Inflammation and Edema Treated by Antibacterial Drugs and Streptokinase Intramuscularly by Joseph M. Miller, M.D.; John A. Surmonte, M.D.; Milton Ginsberg, M.D., and Frank B. Ablondi.

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Injuries to the Inferior Dental and Mental Nerves by H. E. Simpson, M.D.S.

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Tranquilizing Drugs in Oral Surgery by Lucian Szmyd, D.M.D., M.S.; Clarence M. McCall, D.M.D., M.S., and Earl T. Enright, D.D.S., M.D.S.

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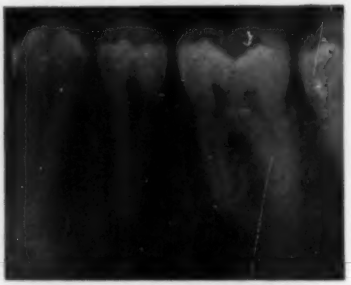

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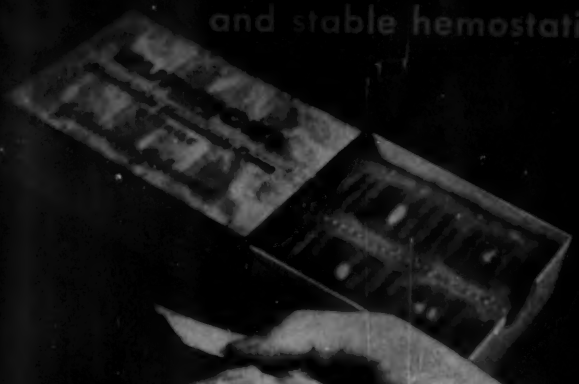

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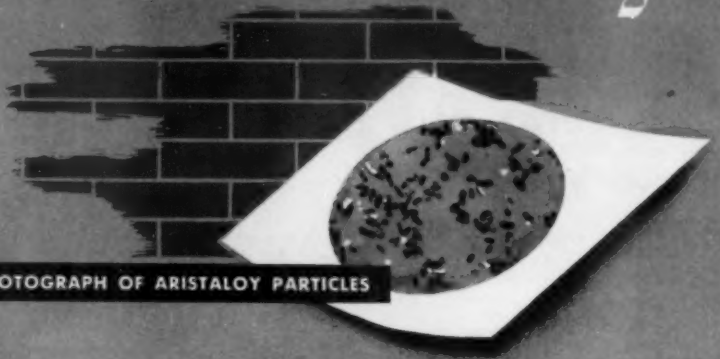

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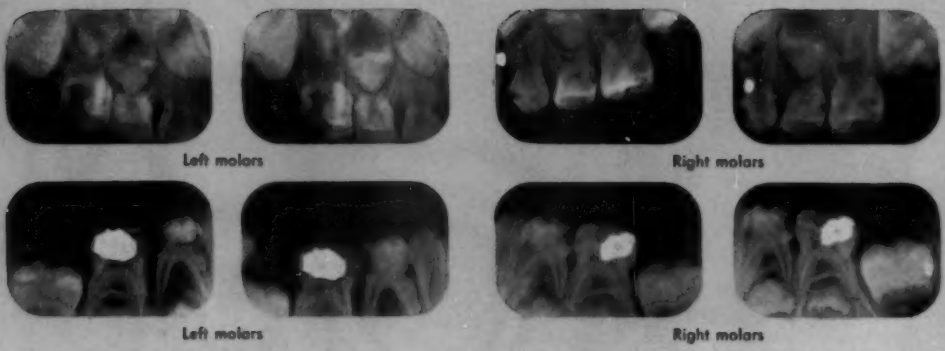

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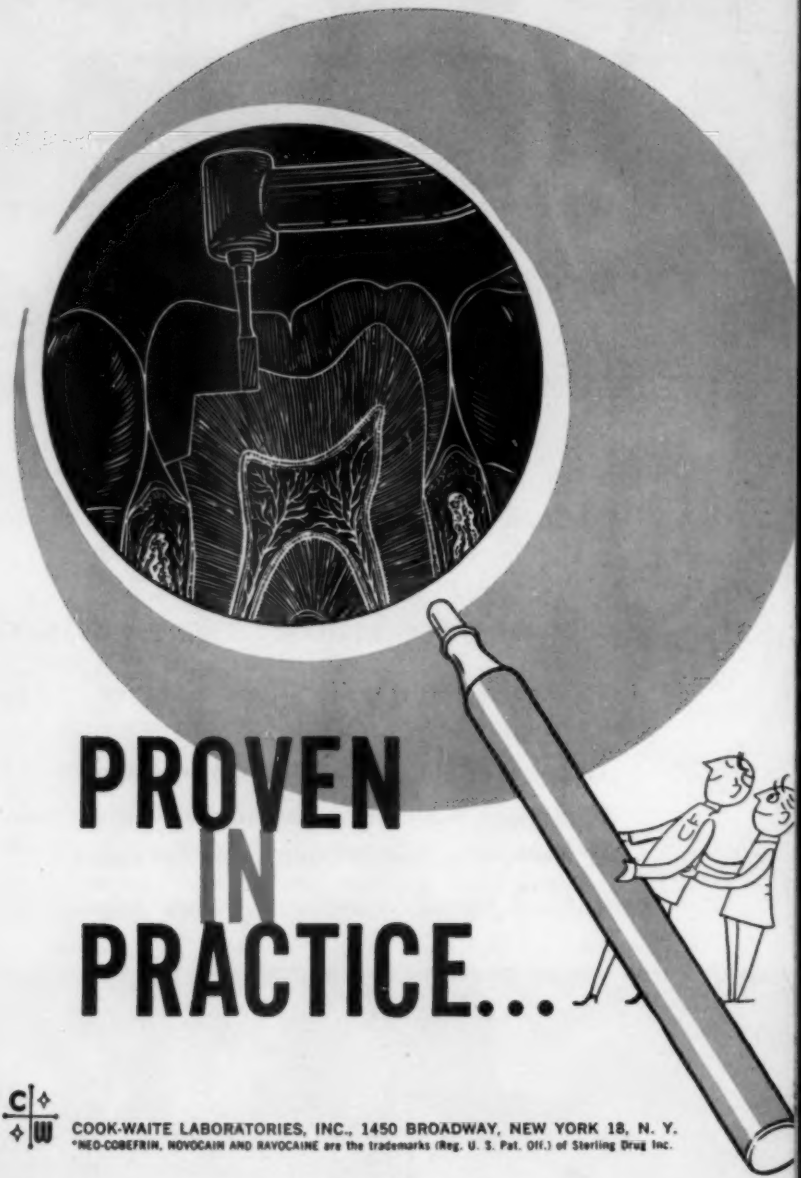

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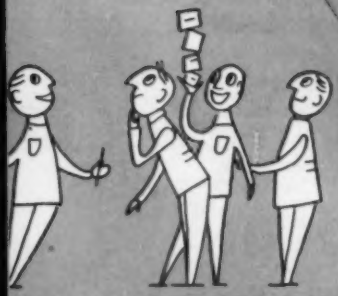

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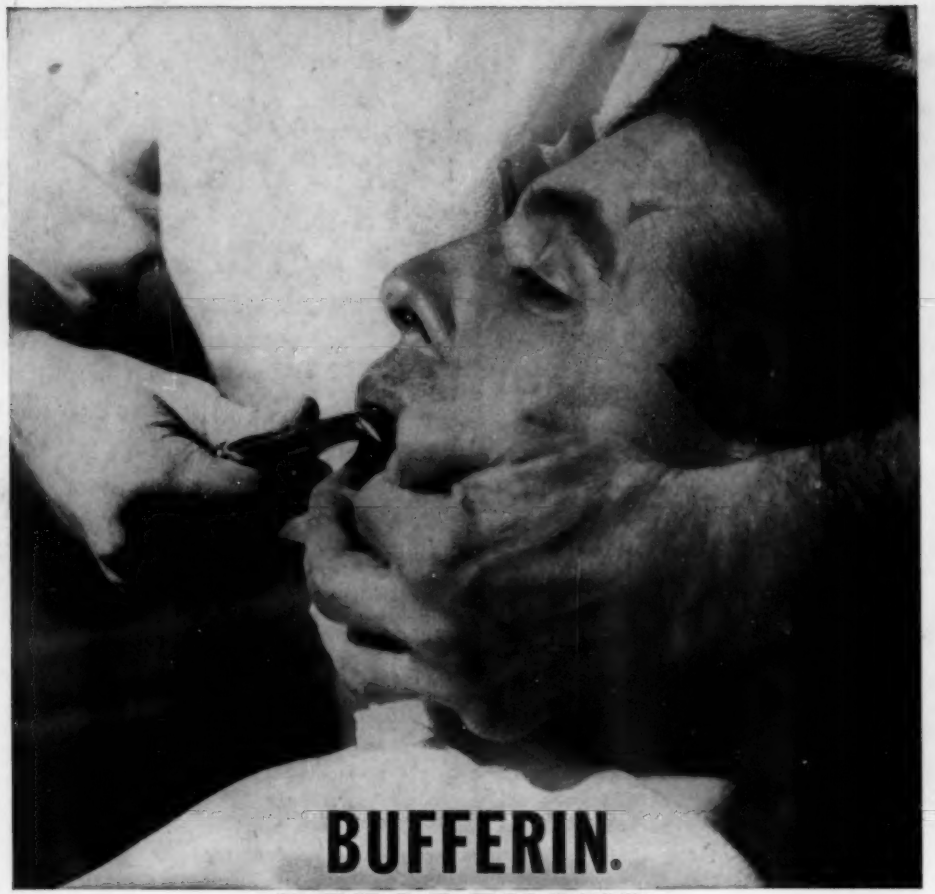

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